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COMMERCIAL & GENERAL REVIEW

DENMARK AND ATOMIC ENERGY

On the peninsula of Risø in Roskilde Fjord—about 35 kilometres from Copenhagen—the Danish Atomic Energy Authority has established a research station to promote the peaceful uses of atomic energy in the interests of the Danish nation. The station will have three experimental reactors, which have been designated DR1, DR2, and DR3. By T. Bjerge. . . . . *page 11*

FROM UNWRITTEN LAW TO MODERN PRACTICE

Primitive law operated in Greenland down to a few years ago, but social, political, economic, and cultural developments since the war have changed the Greenlander's views on law and morals in family affairs, in regard to the penal code, and on the general maintenance of law and order. By Verner Goldschmidt. . . . *page 16*

SIDELIGHTS ON DENMARK . . . . *page 20*

SHIP MODELS IN DANISH CHURCHES

The custom of hanging model ships in churches, which typifies the intimate relations between seamen and the church down the ages, is more widespread in Denmark than anywhere else. The article tells of the symbolism of these ships and the traditions associated with them. By Henning Henningsen. . . . . *page 21*

PRINCESS MARGRETHE'S FARM

Among the many gifts received by Princess Margrethe, the heir to the Danish throne, on her eighteenth birthday last April was a farm complete with cows and pigs, presented free of debt by Danish farmers. Deliberately not a show-piece, the farm is, in size, history, appearance, and day-to-day work, a typical example of the 200,000 Danish holdings. By Knud Ravnkilde. . . . . *page 24*

PURE DRUGS

From a modest start nearly fifty years ago the Danish pharmaceutical industry has developed on a considerable scale—compared with the country's chemical industry as a whole. Besides meeting about two-thirds of the domestic requirements of pharmaceuticals, the industry carries on a large export trade, which in 1957 amounted to about 105 million kroner spread over some 70 countries. The total production of the industry the same year was just over 170 million kroner. By C. Treschow. . . . . . *page 28*

ALL THE BEST FROM THE SEA

The title is one of the slogans of the Danish fish trade. The truth of the statement it makes is based on the quality inspection which—like the inspection of agricultural produce—is carried out at every stage of production—from the moment the fish is hauled out of the sea until it lies on the kitchen table. By Poul F. Jensen. . . . . *page 30*

MEASURING THE EARTH'S MAGNETISM

Sensitive instruments for measuring terrestrial magnetism and other geophysical phenomena are in permanent service at the magnetic observatory near Copenhagen. Here also a large number of apparatus are tested by the Danish Meteorological Institute, which operates this and similar observatories in Greenland, and which exports the instruments to places all over the world. By Kristen Hesselager. . . . . *page 32*

OFFICE MACHINERY MAKES THE GRADE

The United States, home of modern office machinery, has rapidly become the biggest customer for Danish office machinery. A Danish duplicator of striking design, which introduced a new printing technique, has greatly extended the scope of this machine. By Georg Mynster. . . . . *page 34*

FOUR-LEGGED EMIGRANTS

High milk yield and great adaptability to climate are characteristic of Danish breeding cattle, which are exported to four continents. They are completely free from tuberculosis and foot-and-mouth disease. By H. C. Clausen. . . . . *page 35*

The cover, which was drawn by Alex Secher, relates to the article about Greenland and shows Godthåb, viewed from Hans Egede Mountain

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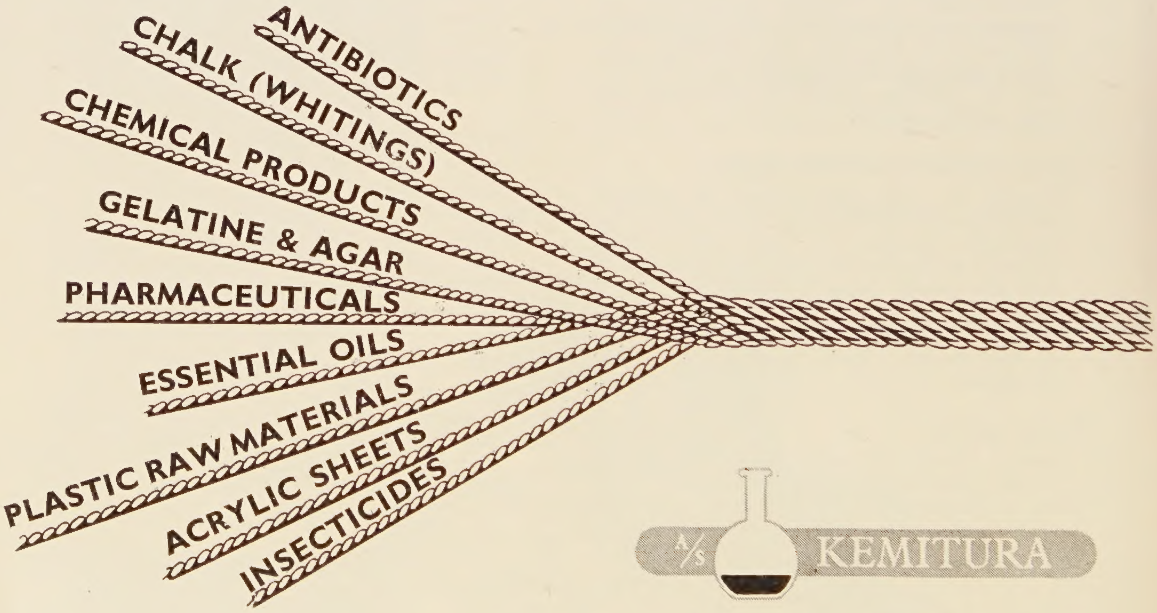
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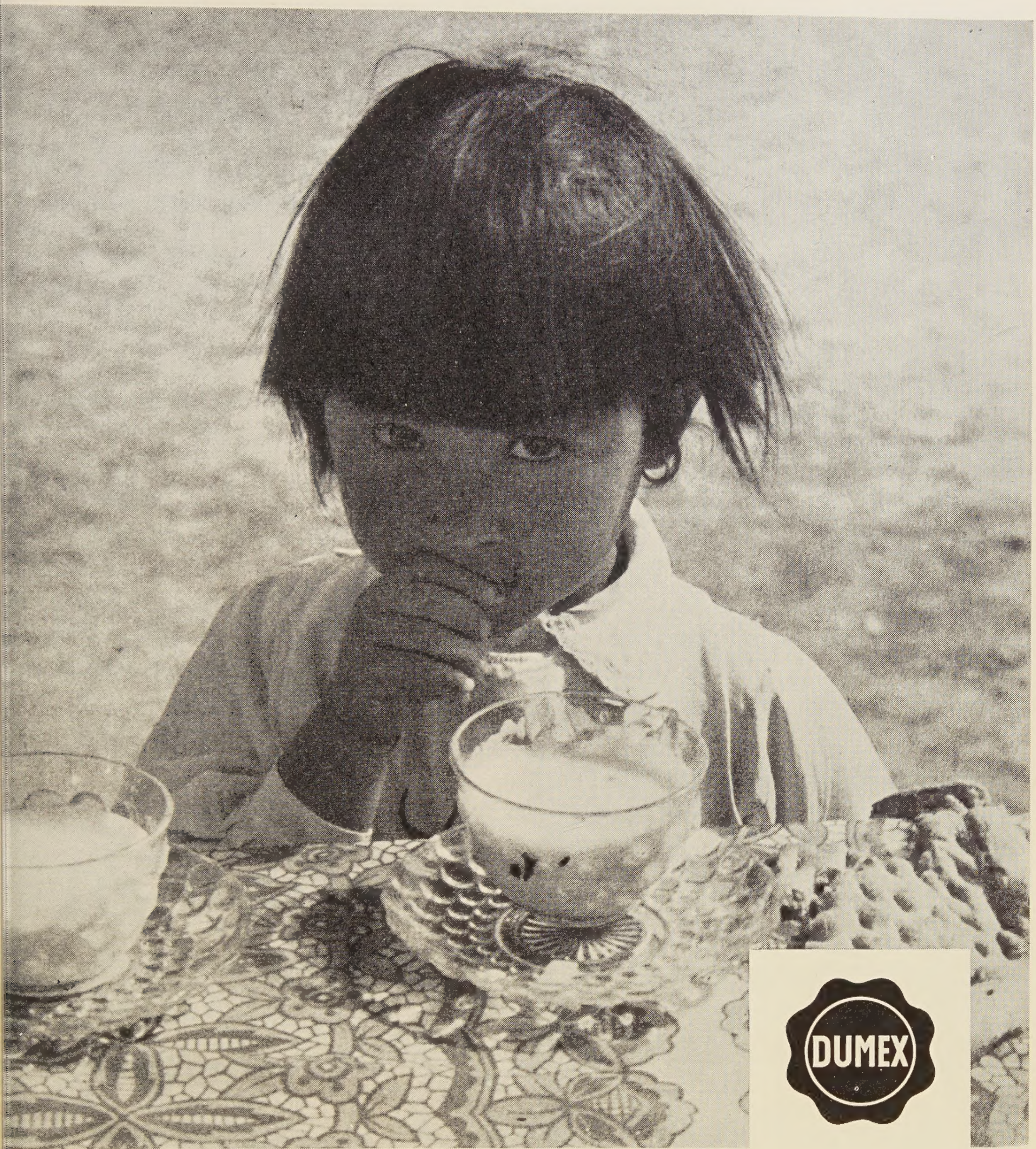

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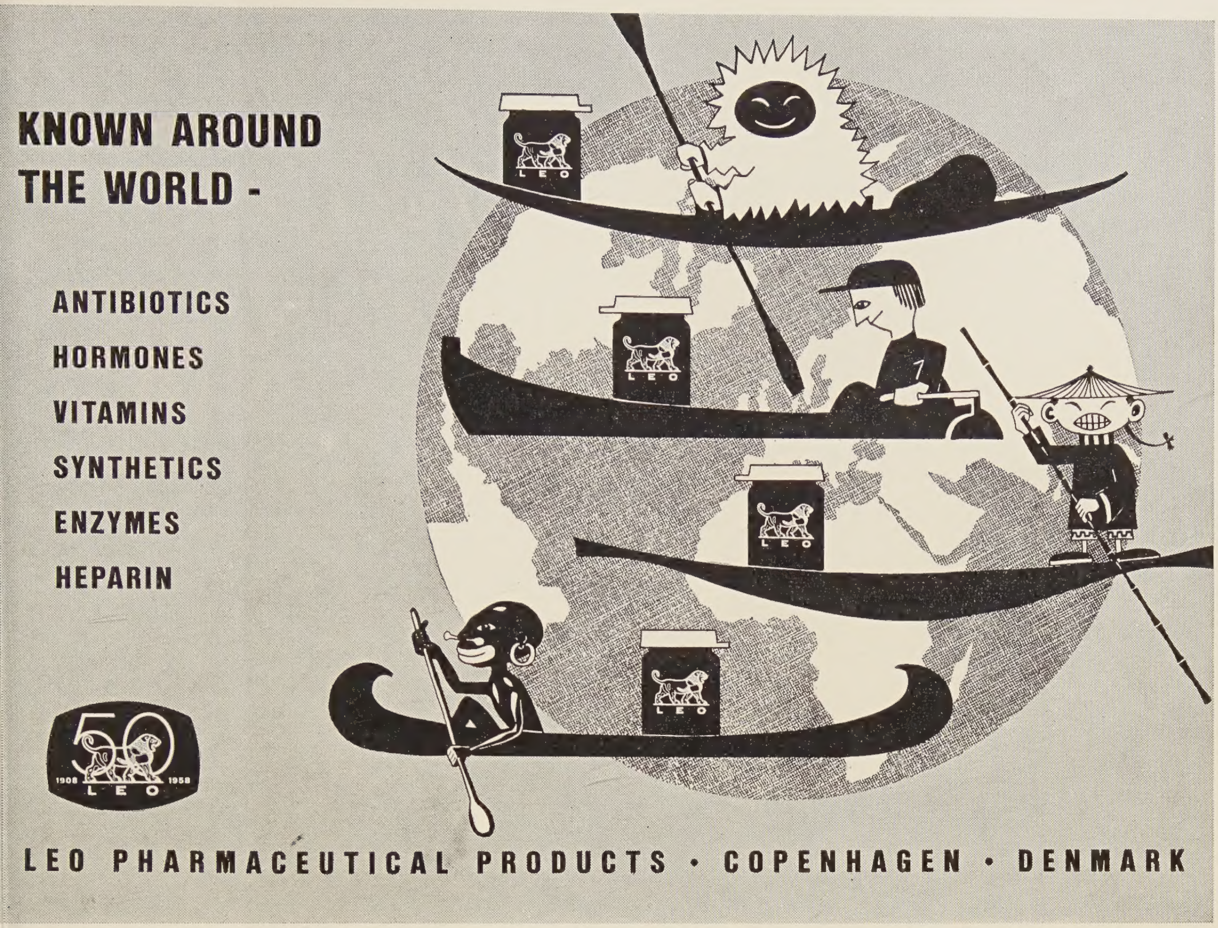

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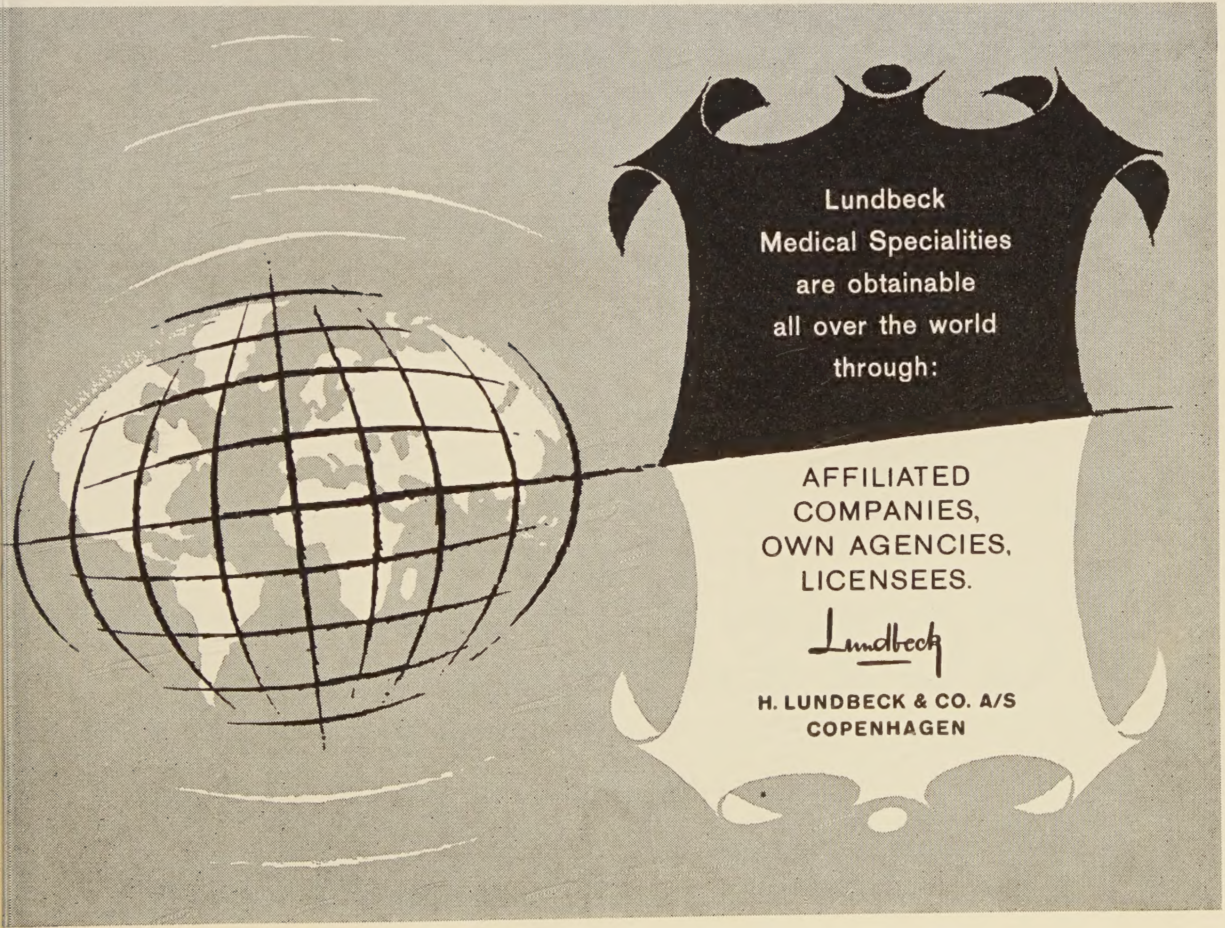

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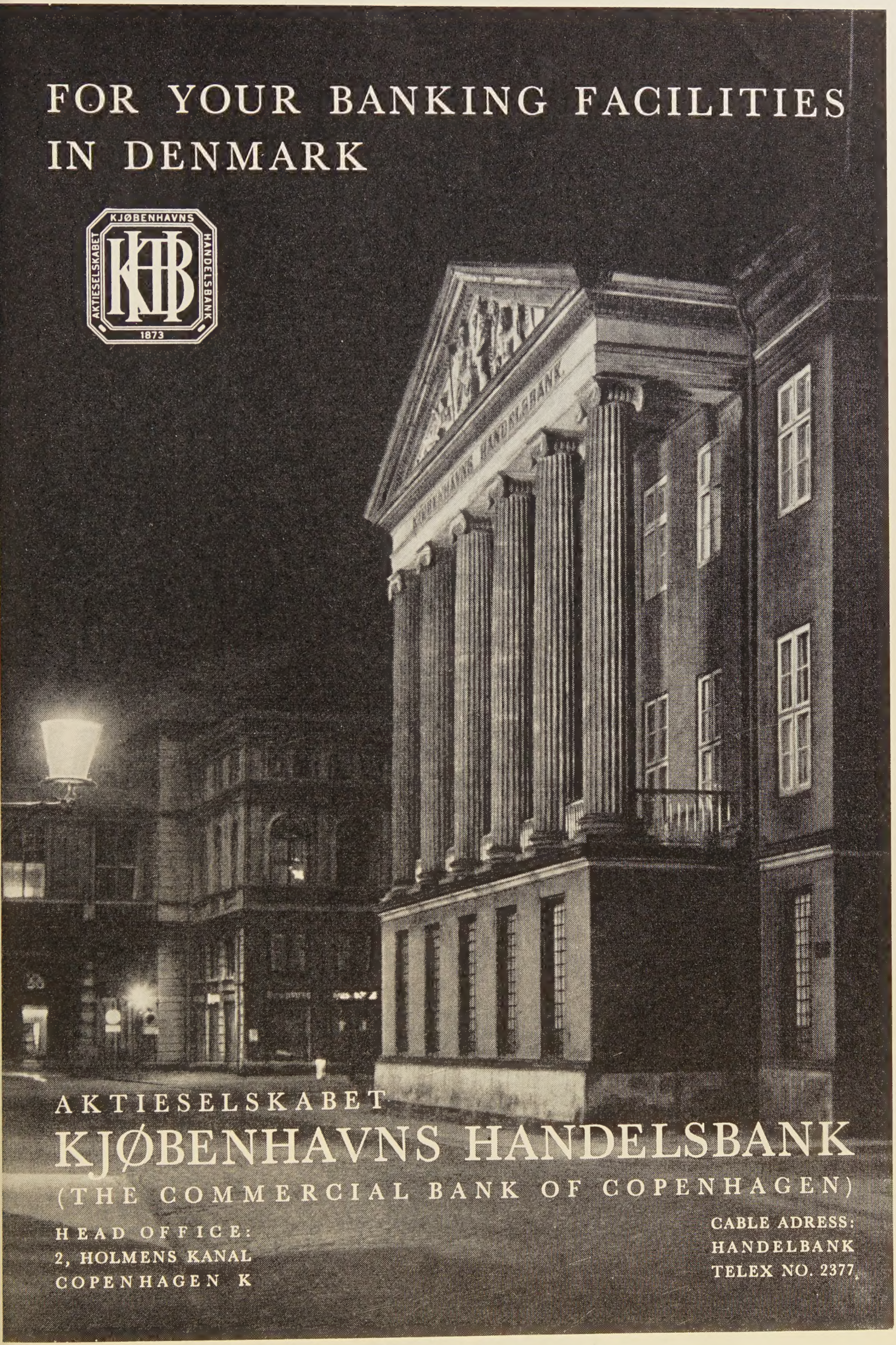

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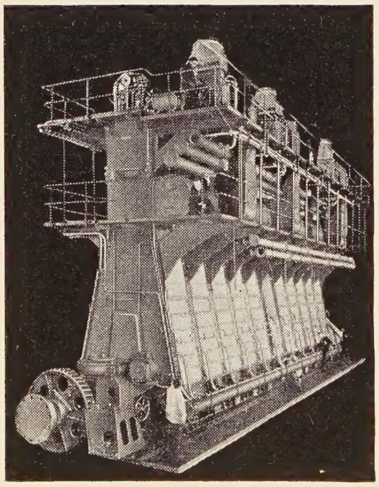

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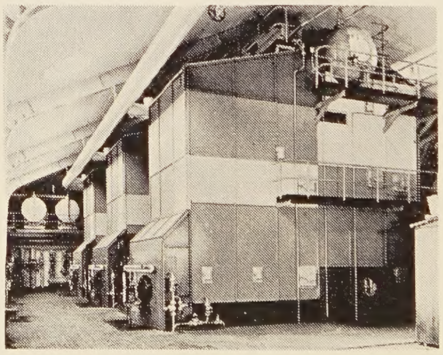

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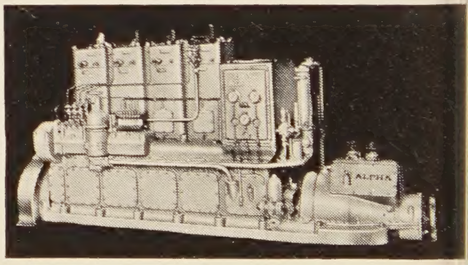

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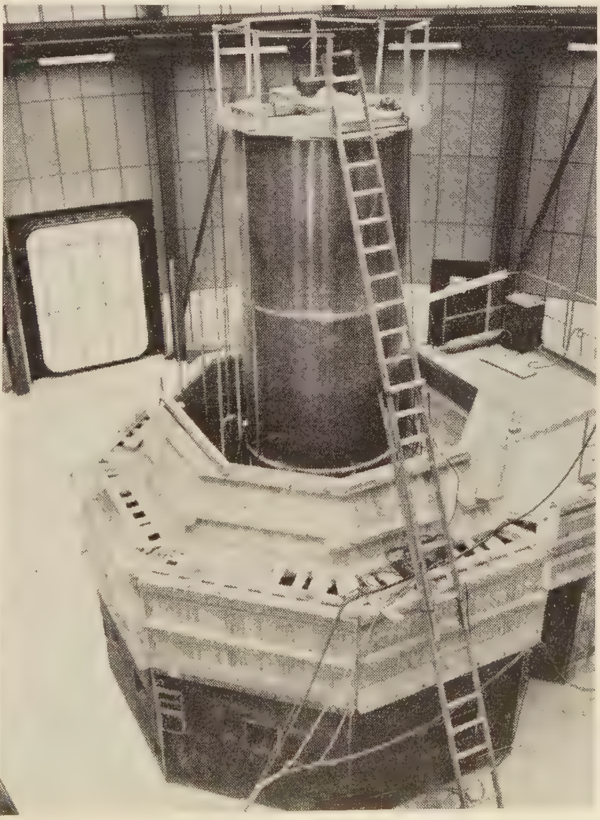
Denmark and Atomic Energy

By T. Bjerge, Professor, Dr. phil.

On the peninsula of Risø in Roskilde Fjord - about 35 kilometres from Copenhagen - the Danish Atomic Energy Authority has established a research station to promote the peaceful uses of atomic energy in the interests of the Danish nation. The station will have three research reactors, which have been designated DR 1, DR 2, and DR 3

Like other Western countries, Denmark has a rapidly increasing consumption of fuel, both for domestic heating and for industrial use, including the production of electricity. Since 1918 the consumption has risen fourfold, or in other words has about doubled in every twenty years; and there is a likelihood that it will continue to increase, if perhaps less rapidly. The increase is due in part to the rise in population, and in part to increasing industrialization and mechanization. Almost the entire consumption of fuel has to be met by imports of coal, coke, and oil, and the cost of these imports accounts for a considerable proportion of the national expenditure in foreign currency, being at present about 1750 million kroner, roughly equal to £ 86 million sterling or 250 million dollars a year.



Reactor DR2 under construction (June 1958)

There do not appear to be any immediate difficulties in procuring these raw materials for the required supply of energy, so long as the necessary foreign exchange is available; but the situation may change, owing to political conditions outside Danish control. Moreover, world supplies of coal, and especially oil, are by no means unlimited; and so, because the consumption is rapidly increasing in most other countries also, there will undoubtedly sooner or later be a considerable increase in the prices of both coal and oil, which may even become scarcity commodities.

It follows that the use of new forms of energy subject to different economic and political conditions is a problem of vital concern. One such form is nuclear energy, the practical potentialities of which have made enormous strides since the underlying process, the uranium chain reaction, was demonstrated during the war. This took place in 1942 in the United States, and was the result of many years of research into atomic and nuclear structure in many countries.

New Energy Sources

In spite of the short period of time that has since elapsed, the large countries which brought great technical resources into play at an early date have already gone far in the application of nuclear energy. The apparatus in which the chain reaction takes place is called a reactor, and a number of power-producing reactors for the production of electricity, etc. have been built, are being built, or are projected.

Moreover, the maintenance of the chain-reaction process makes new and highly exacting technical demands on the materials employed, while the intense radiation from the products of uranium fission necessitates extensive safeguards in the construction of the reactor. Consequently, reactor techniques - in spite of the considerable results already achieved - are rapidly developing and it is still an open question which types will prove best in the long run.

Thus, in those countries which have been engaged in atomic energy from the start, as well as in most other technically developed countries, an intensive research work is therefore going on by means of research reactors. These are small reactors in which it is possible to reproduce—usually by means of enriched uranium—the conditions with regard to neutrons, temperature, and so forth, which prevail in power-producing reactors, and thus carry out materials testing in connection with technical reactor development.

Chairman Professor Bohr

Being vitally interested in nuclear power, and in ensuring that none of the opportunities which this new technical advance might hold for her industries would be missed, Denmark naturally wished for a share in the technical side of nuclear research.

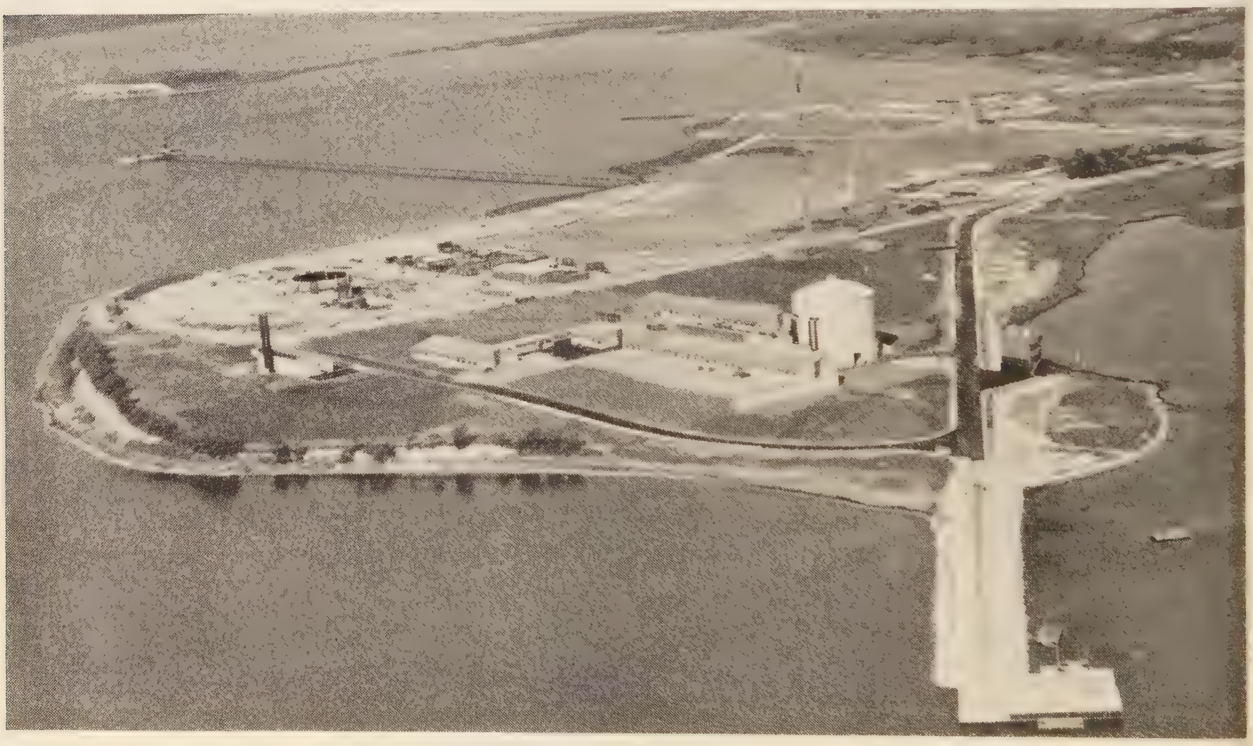
This was rendered possible by the change in the attitude of the "nuclear Powers" which took place in 1955 and was expressed, *inter alia*, in President Eisenhower's Atoms for Peace Programme and the United Nations Atomic Energy Conference the same year. As a result, a great deal of technical knowledge was released and an opportunity was provided for obtaining enriched uranium for research reactors, an opportunity which was exploited by Denmark through agreements with the United States and the United Kingdom in 1955.

By an Act of December 21, 1955, the Danish Atomic Energy Authority was set up, with the object of promoting the peaceful uses of atomic energy in the interests of the Danish nation. Professor Niels Bohr is the chairman of the Authority; and the chairman of the executive committee which directs the day-to-day work is Mr. H. H. Koch, permanent Under-secretary of State.

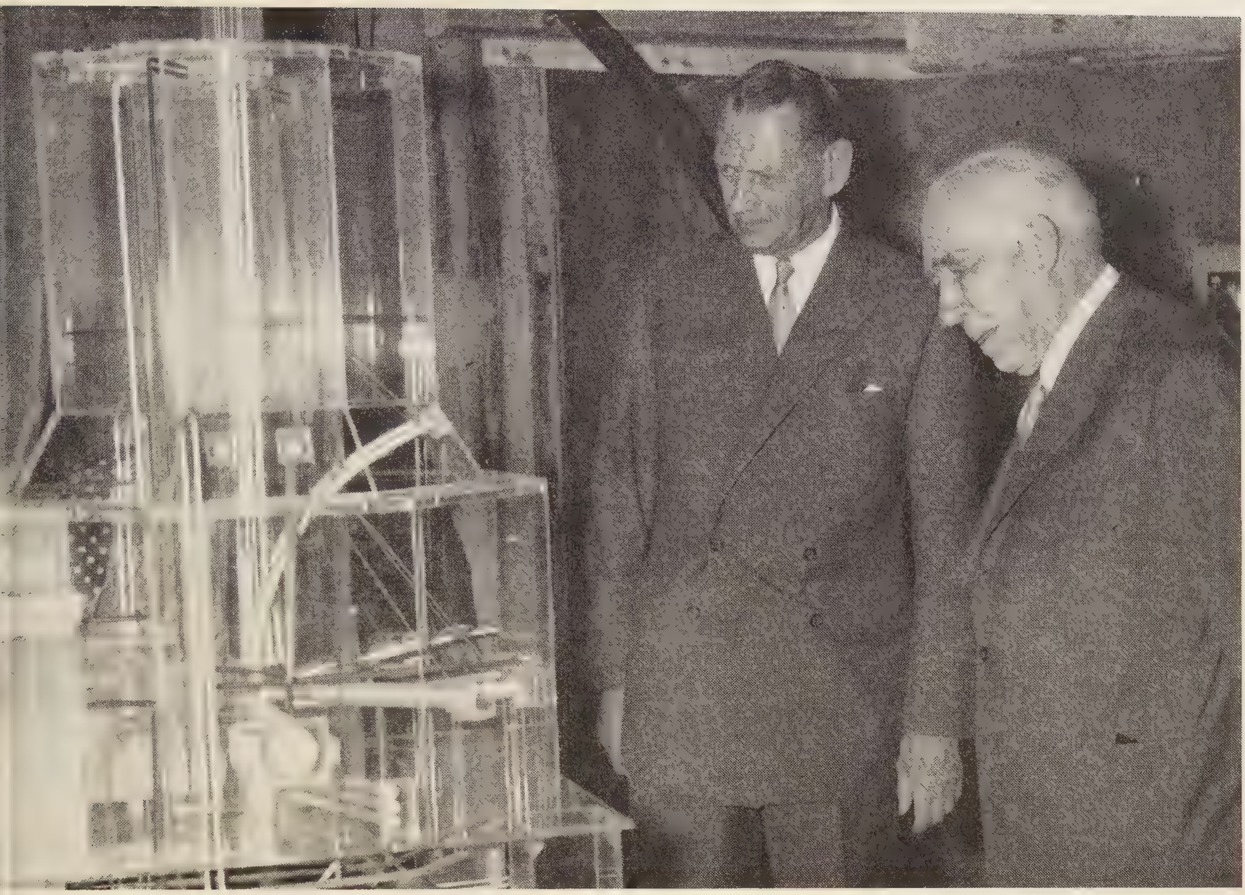
Risø Research Station

An immediate start was made on the plans for a research station on the Risø peninsula in Roskilde Fjord, and work on the site began in July 1956. The consulting engineers were the firms of Steensen & Varming and Mogens Balslev; the architects were Professor Preben Hansen and Mr. Paul Niepoort; and the consulting landscape gardener was Professor C. T. Sørensen.

A peninsula was chosen as the site because the reactors and laboratories, where large quantities of radioactive



Air photograph of the west part of the Risø Research Establishment. The reactor DR2 is in the foreground; and DR3, under construction, is shown on the left (August 1958)



From the opening of the Risø Research Establishment. Professor Niels Bohr explaining the model of DR2 to King Frederik

material are handled, could be isolated fairly cheaply. Much of the work, however, is in laboratories where there is extremely little radioactive material, or none at all, and these are situated adjacent to the peninsula.

These laboratories were the first of the plant to be completed; and by the summer of 1957 it was possible to move into completely installed laboratories for the chemical, reactor, electronic, and physics departments. These departments, each under a departmental head, were already being staffed with scientific workers, who to begin with were given instruction in the basic principles of reactor physics and reactor techniques at courses held in the secretariat of the Atomic Energy Commission in Christiansborg Palace. Afterwards they shared in the planning of the laboratories and the work that was to start there, and so were able to take up this work as soon as the buildings were completed.

Three Research Reactors

On the long term this work will be connected with the three experimental reactors which the station will in time possess, and which have been designated DR1, DR2, and DR3. As indicated above, these reactors while in operation will produce a neutron atmosphere inside them, and it will be possible to subject materials to bombardment by neutrons, partly for materials testing and partly for producing radioactive isotopes, the application of which continues to grow in science, medicine, and industry.

Both in DR2, the designs and principal components of which have been supplied by the United States (and for which the American Government is making a grant), and in DR3, which is of British construction from British and Danish parts, the volume and intensity of the neutrons will be adequate for many kinds of materials testing. This applies in particular to DR3, in which considerably larger parts can be irradiated than in DR2, a factor of special importance when it is desired to test "fuel element" types and their cooling. DR2 should be completed by the end of 1958, when a prolonged running-in and training period will ensue. DR3 is expected to be completed by the end of 1959.

Training in Operating Reactors

There are many objects which do not need such an intensity of neutrons, but which require that this should remain constant, or that the reactor should be capable of rapid starting and stopping. For this purpose DR2 and DR3 are less suited, and it is for this that the much smaller DR1 has been built with components supplied from America. This reactor started up in August 1957, and so far has chiefly been used for providing instruction and training in the operation of a reactor as well as in the techniques of measurement that are connected with atomic energy research, with the control of a reactor, and with the radiation from a reactor or from radioactive materials.

It has thus been possible to supplement the preliminary theoretical training of the station personnel by means of practical exercises. Engineers from industry and power stations and some engineering students have also had an opportunity of obtaining instruction on DR1.

Painstaking Control

A very important aspect of the work with atomic energy is the painstaking control to ensure that all construction and all tests are so carried out that the personnel are not exposed to radiation or radioactive contamination, and that neither the plant nor the surrounding district is exposed. This work is the responsibility of the radiation control (or health physics) department which was established about the same time as the other departments, the laboratory being completed at the end of 1957.

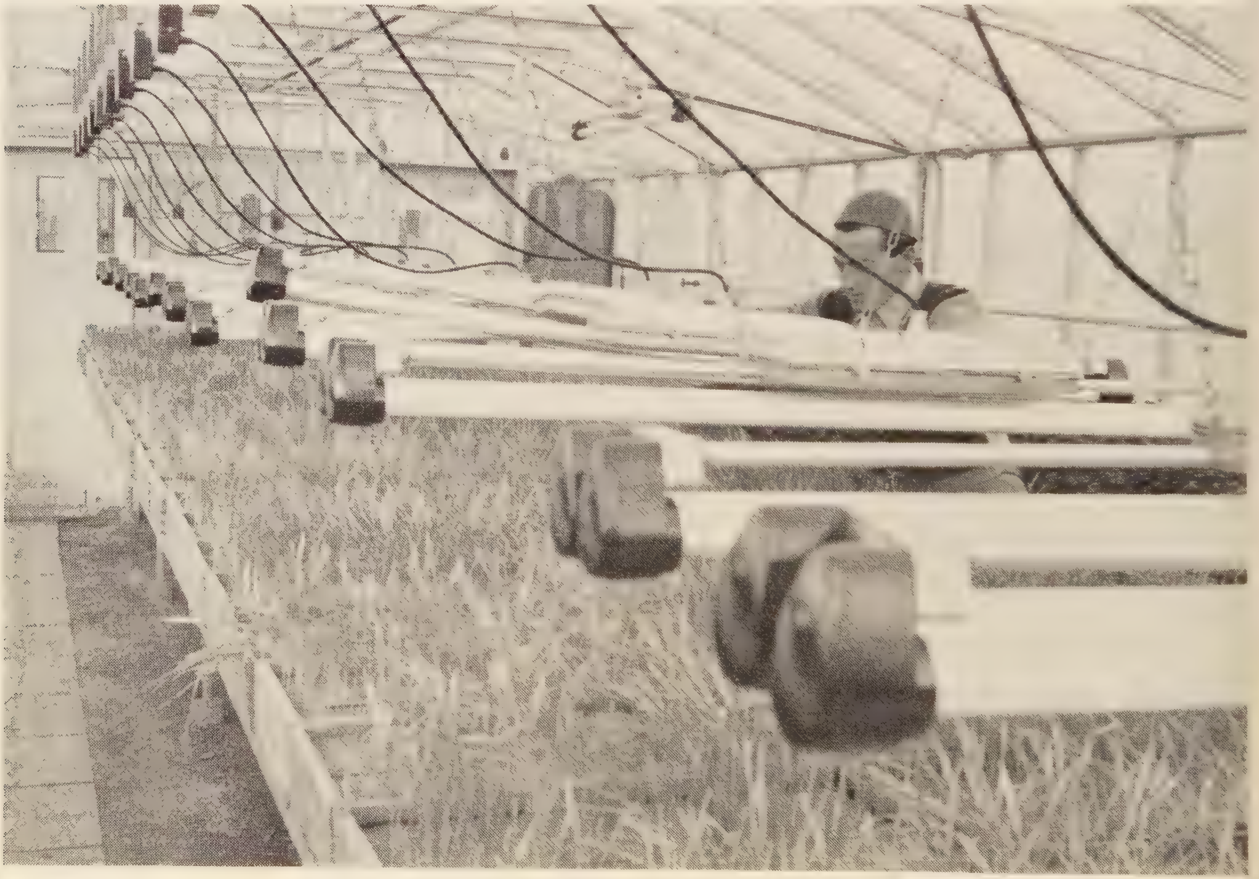
The control consists both in a careful examination in advance, of all constructions and test mountings involving a risk of radiation, and in radiation measurements when the test is in progress. The instruments are so sensitive that it is possible to measure radiation intensities which are about 100 times smaller than any that can be harmful. In addition, the department checks the radiation received by all employees; every person carries a film strip which registers radiation, and the strips are checked every week.

Six Scientific Departments

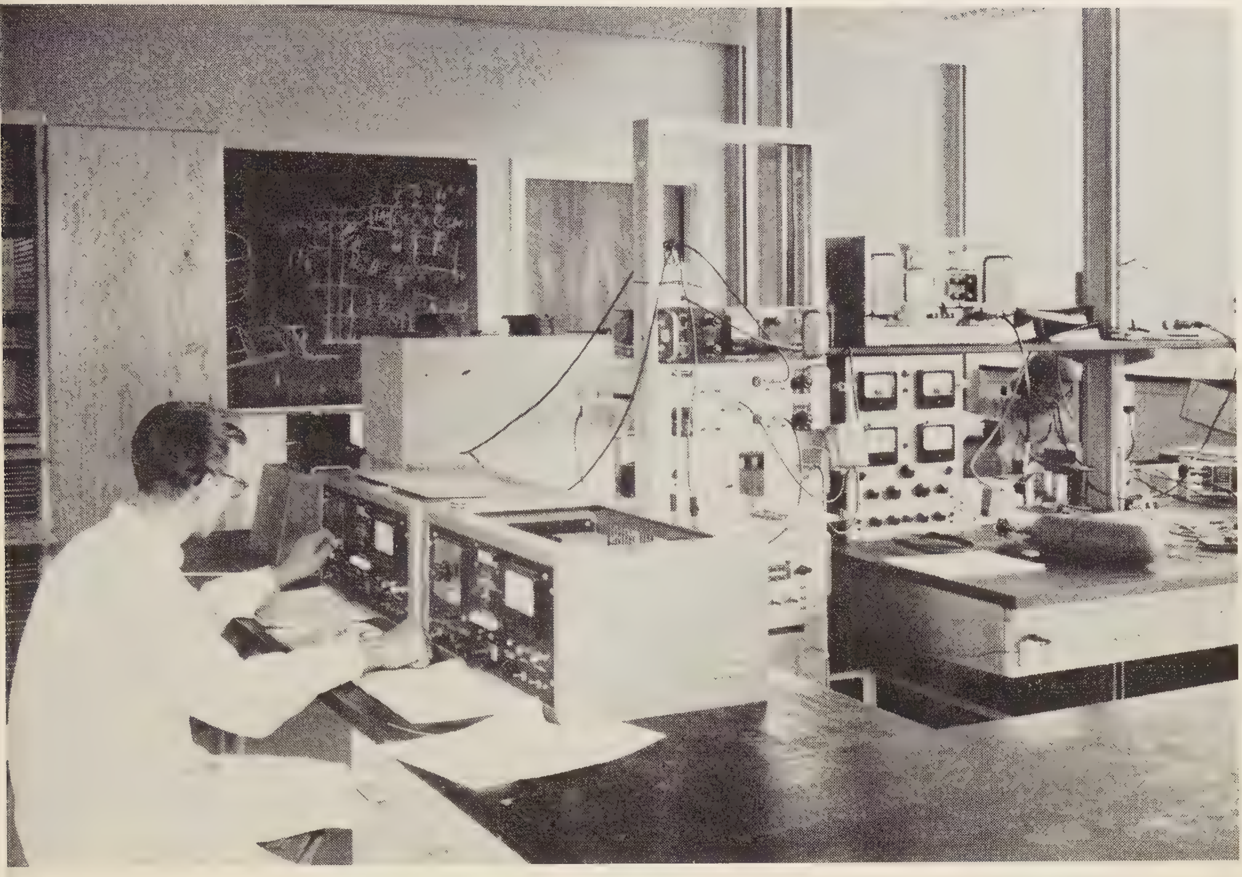
Furthermore, the air, the soil, and the water are checked for radioactivity, and all waste water is under control. Radioactive waste must not be discharged into the fjord, but must first pass through a decontamination station where it is distilled and freed from radioactivity.

In 1957, in addition to the five departments already mentioned, a department of agricultural research was established, as it was naturally desired to utilise the Risø station in the service also of agriculture. The experiments are on three lines. First, irradiation of seeds and growing plants in order to develop improved varieties by means of mutations. This is long-term work; but there is active cooperation with plant breeders all over the country, who send in seed and plants for irradiation and thereafter carry out the growing tests in their own test-fields. Secondly, irradiation experiments are made on potatoes and green vegetables with a view to developing better methods of storing and preserving than those now used. Canned meat in small tins can also be irradiated; for experiments with the preservation of bacon a special irradiation facility - a linear accelerator - is planned. Thirdly, experiments are made on the plant-metabolism, including the absorption of phosphorus from fertilized soil, by means of radioisotopes.

The six departments into which the Risø station is divided have separate duties and specially trained staffs; but the fact that they all belong to one institution, that their departmental heads are in daily contact with one another, and that many problems are studied by several departments, should provide the best conditions for successful work by the station as a whole. Besides the scientific



In the greenhouse of the Agricultural Research Division at Risø. A test growth of irradiated seed is in progress. Danish plant-breeders also send in seed for gamma irradiation at the station



One of the rooms of the Health Physics Laboratory. Tests of the »background« radioactivity of the soil are being carried out

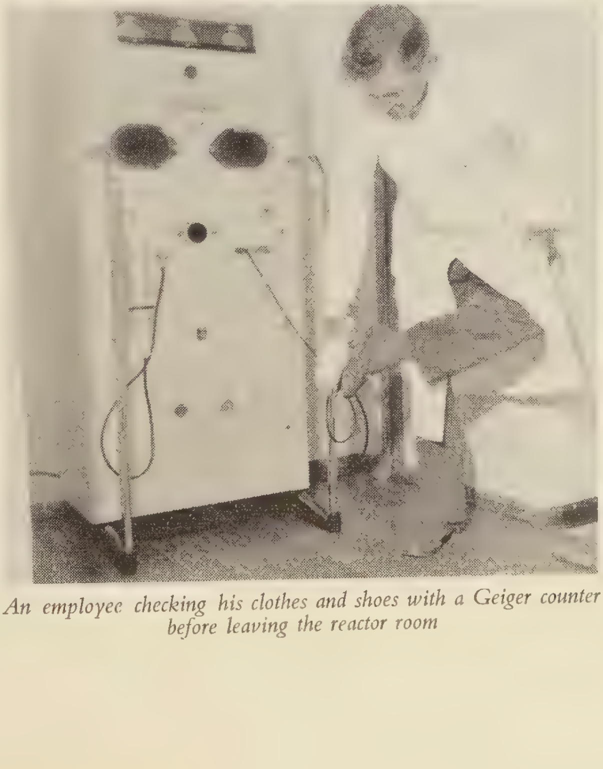
departments there are administrative offices, a library, a canteen, a workshop, and a repair and maintenance department.

King and Queen at the Opening

With the building of an auditorium the constructional work has been more or less completed with the exception of reactor DR3 and the laboratories connected with it. The official opening took place on June 6, 1958, and was attended by the King and Queen, who inspected the plant together with guests from Denmark and other countries.

The staff numbers at present about 250, of whom approximately 80 are scientists; but the number will grow as the plant is developed. It was not desired that a new town should be built for the personnel; and so, apart from about 15 engineers and craftsmen, for whom it was necessary to provide accommodation in the vicinity of the station, most of the employees live in and near the town of Roskilde and some in Copenhagen, with which there are fairly good train and bus connections.

A large plant such as this obviously costs a good deal of money; and about 100 million kroner was allocated for its construction. But it must be borne in mind that the fuel required to supply the country's power costs nearly 20 times this amount every year, and that a single nuclear power station of reasonable size costs several hundreds of million kroner. As many such stations will probably have to be built in the future, it is worthwhile to make an effort in order to acquire - through research - the knowledge that will enable us to choose the most economical types for our purpose. Technical and scientific research will also, directly and indirectly, afford the manufacturing and other industries a better chance of keeping abreast of developments, and thus will help us to become as well equipped as possible for the solution of those problems with which our country is confronted in the Atomic Age.



An employee checking his clothes and shoes with a Geiger counter before leaving the reactor room

The District Court in session at Godthåb. The magistrates (right) are all Greenlanders

From Unwritten Law to Modern Practice

By Verner Goldschmidt, dr. jur.

Ministry for Greenland

Primitive law operated in Greenland down to a few years ago, but social, political, economic, and cultural developments since the war have changed the Greenlander's views on law and morals —in family affairs, in regard to the penal code, and on the general maintenance of law and order

In 1950 a period of reform began in Greenland which has brought radical changes in the technical, economic, cultural, health, and administrative spheres. Harbours, hospitals, schools, houses have been built; a broadcasting service has been established; a new judicial system has been developed; contacts with the outside world have been extended. It goes without saying that such a rapid and all-round development could not fail to leave its mark on the Greenlander's view of law and morals.

Coordinating Danish and Greenland Law

The question which dominates the Greenland people's conception of law today is undoubtedly the desire for full equality between Greenlander and Dane living side by side in Greenland.

Before the new reforms, Greenlanders and Danes were subject to separate judicial systems. The Greenlanders, on the whole, were bound by an unwritten law of custom, while the Danes, when not prevented by local natural conditions, were chiefly subject to Danish law.

After the war, the Greenlandic population made increasing claims to judicial equality for everyone, while emphasizing the importance of adapting new rules of law to the geographical and social conditions of local life. They wanted the same legal system as the Danes, but at the same time they wished that consideration should be paid to local conceptions of law and morals. It is easy to see that this view of the judicial problems was calculated to give the administration and the legislature a good deal of speculation.

Parents and Children

In surveying the developments which have taken place in some of the more important spheres of everyday life t is natural to begin with a reference to the relationship between parents and children. Free sexual relations have been widespread among young Greenlanders from the earliest times. In spite of strong moral and religious influence, it has been difficult to alter the rather widespread attitude that there is nothing wrong in having children outside wedlock. The number of such children has consequently always been comparatively high. This is perhaps connected with the fact that in old Greenland children, whether born of married or unmarried parents, were regarded as a social necessity. Under the ancient natural economy, when hunting was the only important occupation, it was of the greatest importance that there should be descendants who could provide for one when one could no longer provide for oneself.

In old Greenland there were not many women who remained unmarried when they had children. The very fact of having a child, especially a boy, made them an object of attraction. Children were a kind of insurance against old age. No man then was interested in denying his paternity—on the contrary. Today things are different. Also in this respect Greenland has changed character.

A Dilemma

Legislation is about to be introduced which will give children in Greenland whose parents are unmarried equality with other children, as children in Denmark already have. It is interesting that Greenlanders have some misgivings about this. They are not over-enthusiastic that children born outside wedlock should bear their father's name and have rights of inheritance after him. The result is something of a dilemma, for at the same time there is an interest in a unified law in this as in other spheres.

There has also been a change in the Greenlander's attitude to marriage. Before the colonial period there were no such things as banns and weddings. When a man and woman wished to live together they did so, without the officiation of any sort of authority. The same informal procedure applied when the partners grew tired of each other; they merely went their separate ways. No special arrangements were required on such an occasion. But in the colonial period a great change took place.

Separation and Divorce

The first missionary, Hans Egede, who arrived in Greenland in 1721, insisted that Christians should be married in church. There were separations during the first centuries of the colonial period but they were disallowed by the church from the beginning of the nineteenth century, and down to the passage of the first Greenland Marriage Act in 1955 marriages between Greenlanders could not be dissolved. In the immediately preceding period a demand for the legalization of divorce had grown strongly among the Greenland population. In this as in other respects the Greenlander wanted equality. Under Danish law a single breach of the marriage contract is sufficient ground for judicial separation. But in Greenland some doubt was felt about the advisability of making adultery alone a sufficient ground for divorce. It was thought that some additional ground should be necessary. Greenlanders themselves tended to the view that divorce

An interrogation on a police vessel. The man in civilian dress is a Danish police sergeant; the uniformed policeman is a young Greenlander who was trained at the Danish Police School should be allowed for several acts of misconduct, or for adultery of a particularly grave nature.

The compromise effected in the new Marriage Act permits separation on the ground of a single case of misconduct, as in Danish law, but allows a resumption of marital relations within certain time limits, when the separation is annulled.

Thus after two hundred years of European influence there has been a reversion to the original Greenland practice which permitted dissolution of marriage by separation. It is an interesting fact that, morally and judicially, we have turned full circle, from accepting dissolution to prohibiting it, and then allowing it again.

A Family Economy

In economic affairs also the moral and judicial conceptions are in the melting-pot. The only association necessary under the old natural economy was that of the family. The husband brought home the catch and his wife made from it both food and clothing. Under these conditions there were no economic ties as between one family and another.

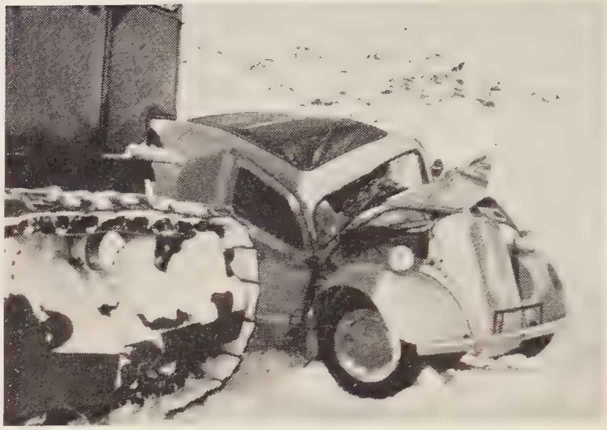
Men would help one another in an emergency and would share their catch with those who had none, but any organized association based on mutual agreement, as in complex modern communities, was unnecessary. A fellowship of consumption there may have been; but there was not, as in modern society, a fellowship of production.

A Greenland hunter could go out in his kayak alone and fish when it suited him and he thought the weather and hunting conditions good, independently of anyone else. But others might need a share of the catch which he brought home. Possibly no one else had been out that day; possibly the local food supplies were depleted. And so it was only natural that as many as possible should receive a share of what was available.

Promises to be Kept

In Denmark and other complex modern communities there are rules, developed over the centuries, which require the fulfilment of promises. This is an important principle of modern society, both judicially and morally. But the family under a natural economy was self-sufficient, as we have seen, and trade was insignificant. In recent years there has also been a change in this respect. It is an important feature of the new reforms that free commercial intercourse has taken the place of the old Government trade monopoly.

The policeman's house at Godthåb. The small annexe serves as detention house and prison



Road accidents are among the cases which a district court has to hear in modern Greenland

The increased number of private traders and the trade which now takes place not only between Greenland and metropolitan Denmark but between the various Greenland settlements have increasingly influenced the conception of the value of agreements and contracts. Greenlanders have become increasingly aware of the importance of binding agreements, because many others besides the person immediately concerned are affected by their fulfilment or non-fulfilment.

The position has now been reached where consideration is being given to the introduction of rules of agreement, sales and purchase, payment, and cheques. Ten years ago this sort of thing would never have been dreamt of. It is an interesting fact, however, that in spheres where they have been closely dependent upon one another the Greenlanders have always made a special point of keeping agreements. Persons building a house have usually relied upon the help of their friends, help which will scarcely ever have been refused. A man's friends would help him to build his house, and later he in turn would help the friend to build his; it was a matter of course that this should be so, even in the absence of any agreement to the effect.

Settling Disputes by Drum Dance

We now come to the developments which have been taking place with regard to the maintenance of the law. In the old Greenlandic community men settled their disputes by drum dances and by homicide. They took the law into their own hands. It was an important object during the early stages of the colonial period to place the maintenance of the law in the hands of special authorities. Down to 1951 no distinction was made between the judicial and the executive power. The first Greenland Administration of Justice Act of 1951 introduced a special judicial system with lower courts consisting chiefly of Greenlandic magistrates and a court of appeal with a lawyer as chairman and two lay assessors. A separate prosecution authority and police system was also introduced. There can be little doubt that these reforms have had a considerable influence on judicial and moral ideas. Greenlanders now know, more than they knew before, that they can resist the State in legal and judicial matters. There used to be a general feeling, dating from the old days, that a man could never prevail against the State, and that it was the Church which was the arbiter of morals. Thanks partly to the new judicial system a feeling of independence has developed in such matters.

It should be said that down to 1954 there existed only scattered rules pertaining to crime and punishment. Offenders were punished largely according to discretion. A criminal law which applies to the whole of Greenland was introduced in 1954, based, however, on Greenland traditions more than on European penal principles. Outstanding in the new system are the strong endeavours which it has encouraged to provide individual treatment and social rehabilitation of offenders.

Offenders Under Control

Regardless, however, of these endeavours, the changes in the Greenland social structure and the increased contact between Greenlanders and Europeans have stimulated a desire for punishment and the isolation of major criminals. The trend has led to a demand for the provision of special buildings for the control of offenders.

The examples given above are evidence that the moral and judicial conceptions of modern Greenland are being reshaped. They are not exhaustive. Many more could be cited from widely different spheres of culture, but those given will suffice to indicate some of the reasons why considerable changes have taken place—and are still taking place—in the moral and judicial life of modern Greenland, hand in hand with the reforms that have been going on during the past seven years.

Development Goes On

Formerly a closed reserve, Greenland has been opened up to the outside world, and this fact, together with its integration into the Danish Kingdom under the amended Constitution of 1953, has given momentum to the development not only in the economic life but also of judicial and moral conceptions. What was right and proper yesterday may no longer be so today. Not everyone is able to keep pace with this development; there will always be some who fail to adjust themselves to new conditions. But the development now in progress cannot be stopped. It is a fact proved by experience in many another place where modern European culture has penetrated, though in most places the development has had more serious social repercussions than it has in Greenland.

One of the main reasons why the transformation of judicial and moral concepts has been smoother in Greenland than in many other parts of the world may be the continual awareness by the Greenland administration of the concurrence of law and morals on the one hand and economic, social, and cultural conditions on the other.

Last summer the Ministry for Greenland initiated a study of the effects of the new legislation on Greenland and the population's reaction to it. Here is Professor Franz From of the University of Copenhagen discussing these matters with two Greenlanders

SIDELIGHTS ON DENMARK

Cylinder Gas at the River Kwai

A Danish firm producing gas has received some extra publicity in connection with the screening of the successful film *The Bridge on the River Kwai* in Ceylon. The firm delivered supplies of gas to a canteen near the famous bridge, where the 400 performers and technicians were able to get refreshments.

The choice of a Danish firm for this contract was not an accident. Danish cylinder gas is well known in many countries.

Best European Milk Yield

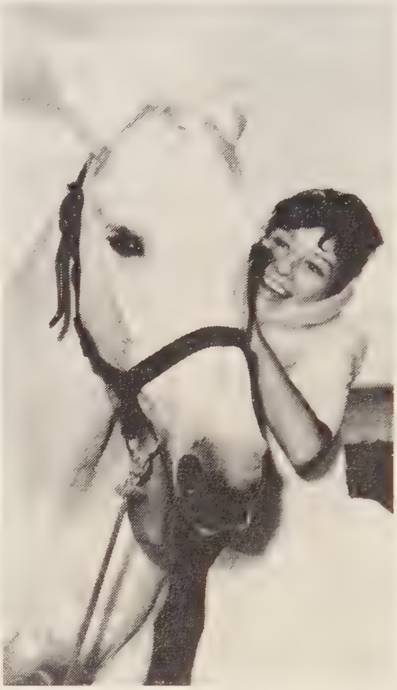
Danish cows, in 1957, had the highest average yield of butter-fat in Europe—175 kilograms (nearly 385 lb)—according to a survey prepared by the Secretariat of the Danish Milk Recording Societies. Swedish cows gave the second highest yield—169 kg (364 lb)—and Dutch cows the third highest—161 kg (355 lb).

Rapid Industrial Progress

Although it had been said that Denmark could never become an industrial country, because it lacked raw materials, industrial production since the war has developed so rapidly that exports are approaching exports of agricultural goods in value. Bacon is still the biggest individual export commodity, but machinery and electrical equipment come before butter.

Characteristically, exports of agricultural machinery last year exceeded imports. This excludes tractors, but these also will shortly be in production at a Danish motor factory.

Manufactures now occupy as many people as agriculture—about 30 per cent of the population.



A Horse on Holiday

A horse is to tell the world about Denmark, taking the leading part in a new film which has been made. It all began with the story, told by a newspaper, about a Copenhagen carter who was allowed to take his horse with him on his holidays because, he said, they would not be real holidays without it. The adventure of the horse—called Sandy Mac—aroused great interest both in Denmark and abroad.

Sandy Mac is dead now; but the story forms the basis of the new film, which was made during the summer by the Government Film Committee. Script and direction are by Astrid and Bjarne Henning-Jensen.

The film will be released—on the suggestion of the Foreign Ministry—in English, French, German, and Spanish editions. It will in due course be included in the Ministry's film distribution service.

Steel for Wood in Fishing Craft

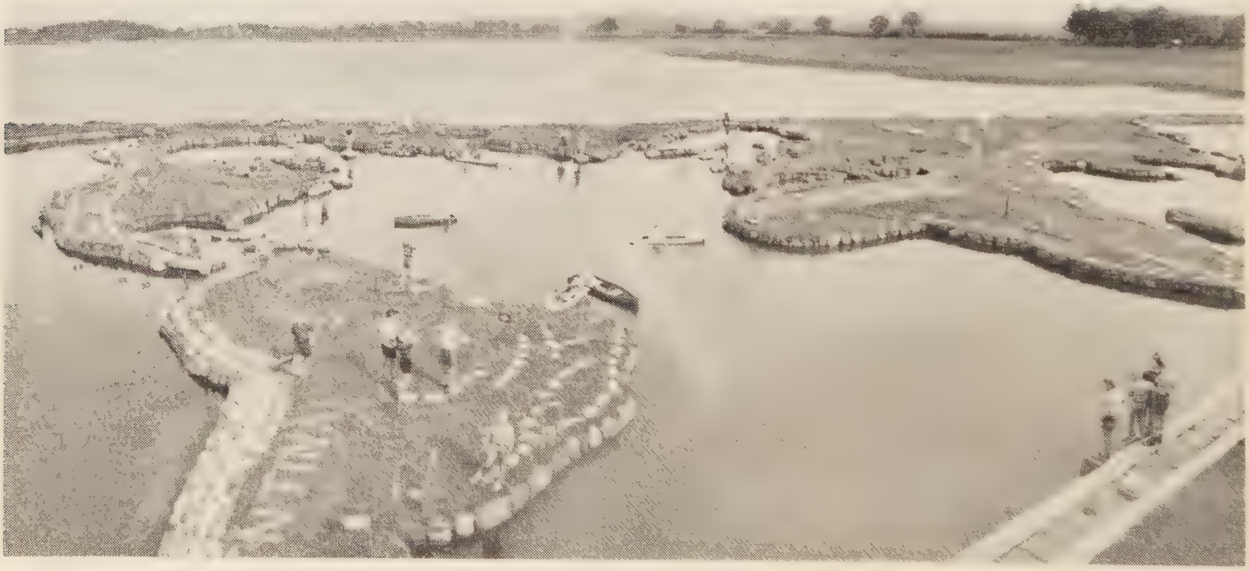
Danish fishermen are becoming increasingly interested in steel fishing cutters, and though only a few of these are in use as yet, they mark an important development. The first results of employing steel fishing vessels appear to have been highly successful, and more will be added to the fleet in the near future.

Scandinavian Weekly in English

The Scandinavian Times is a new English-language weekly, published in Copenhagen. Started on June 27 this year by two Americans, Noel Fox and Daniel Michelson, the newspaper is devoted to promoting commerce, tourism, and culture. It is distributed in over 10,000 copies to English-speaking importers, the US Armed Forces in Europe, and native Scandinavians.

For Table and Floor

Last year textiles became the fourth largest Danish export industry, with Sweden and Norway as the biggest customers, closely followed by the United States and West Germany. The expansion in exports of table-linen and carpets has been especially great.



A Danish artisan, Mr. Soren Poulsen, went as a young man to the U.S.A., where he worked as a carpenter. Returning to his native Klejtrup (near Hobro) in Jutland, he had the idea of laying out a plot in a lake as a map of the world, which has become a great tourist attraction. It is easy to get round the world in the Klejtrup lake

Ship Models in Danish Churches

By Henning Henningsen
Assistant Curator of the Commercial and Maritime Museum, Kronborg Castle

The custom of hanging model ships in churches, which typifies the intimate relations between seamen and the church down the ages, is more widespread in Denmark than anywhere else. The article tells of the symbolism of these ships and the traditions associated with them

Foreign visitors to Danish churches are often surprised by the number of model ships seen hanging from the roofs. It is true that such models are met with here and there in seaside churches elsewhere, especially in Roman Catholic countries, but it is a fact that Denmark is exceptional, as nowhere else is there such a high proportion of them. Over 1,000 such models have been recorded, though about 100 of these have been lost. As there are roughly 2,200 churches in Denmark, this is a very large number. In some churches there are two or more models, and Sønderho church on the shipmasters' island of Fanø (Jutland) has as many as 12.

In Denmark these models are called church ships *(kirkeskibe)*, while elsewhere they are mostly known as votive ship models (French *navires ex-voto*, German *Votivschiffe*). In Roman Catholic countries the models as a rule are true votive offerings, made by seamen who, in time of peril, have promised a model of their ship to their church should they be saved. In Protestant countries this is rarely the case; and of the Danish ship models less than one per cent are true votive ships.

Symbolism of the Ships

A large group consists of models hung up as gifts in memory of late relatives and friends, especially those drowned at sea. Others have been presented on special occasions, such as anniversaries, personal celebrations (confirmation, silver wedding, etc.), royal visits, peace after hard wars, and so on. Many are ornamental gifts, presented purely for embellishment. The models have usually been given by seamen; they were not rich like merchants, officials, or farmers, who could give silver candelabra, brass chandeliers, marble tablets, and other church fittings, and a model ship was inexpensive because it was self-made, while being characteristic of the giver. We may say, in fact, that it was the gift of a particular class.

Most models nowadays, however, are symbolical gifts. From olden times the church was associated by analogy with the Ark and the ship of St. Peter on the Sea of Galilee (*cf.* the architectural term "nave"). Yet, strangely enough, the meaning of the model ship in churches remains obscure. It may symbolize the church itself, or the congregation, or the faith which carries men through life's rough seas; it may refer to the dangerous passage of human life; it may be a symbol of Christian hope, or the hard course which leads to Heaven. Various interpretations can be suggested which may all be equally right or wrong.

Their Age and Number

We do not know whether there were ship models in Danish churches in the Middle Ages, but it is not unreasonable to suppose so. The first record of them is later than the Lutheran Reformation of 1537; thus we read that in 1560 a ship was hung up in the church of St. Olav at Elsinore, and that in 1589 a small ship hung in front of the pulpit in Vindinge church (Funen). These two have long since been lost, and the oldest ship model still extant in Denmark dates from about 1600 (it is at Ho near Esbjerg). From the seventeenth century we know of 15–20 models, from the eighteenth century about 100, and from the nineteenth century about 250. From about 1850 onward the custom of putting ship models in churches became extremely popular, and over 50 per cent of the total date from after 1900. The model ship has become a church fitting of symbolical importance, and every year, on the average, 10 new models are hung in Danish churches, both by the sea and particularly inland.

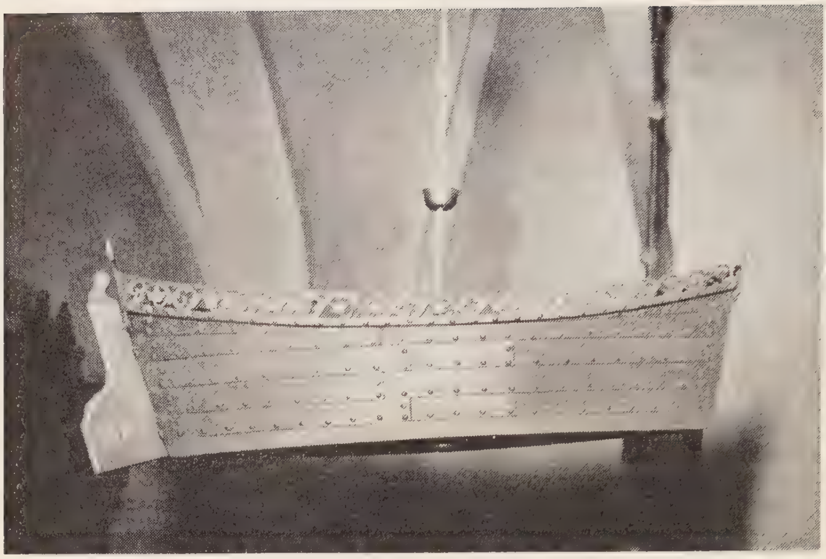
Tradition Requires Sails

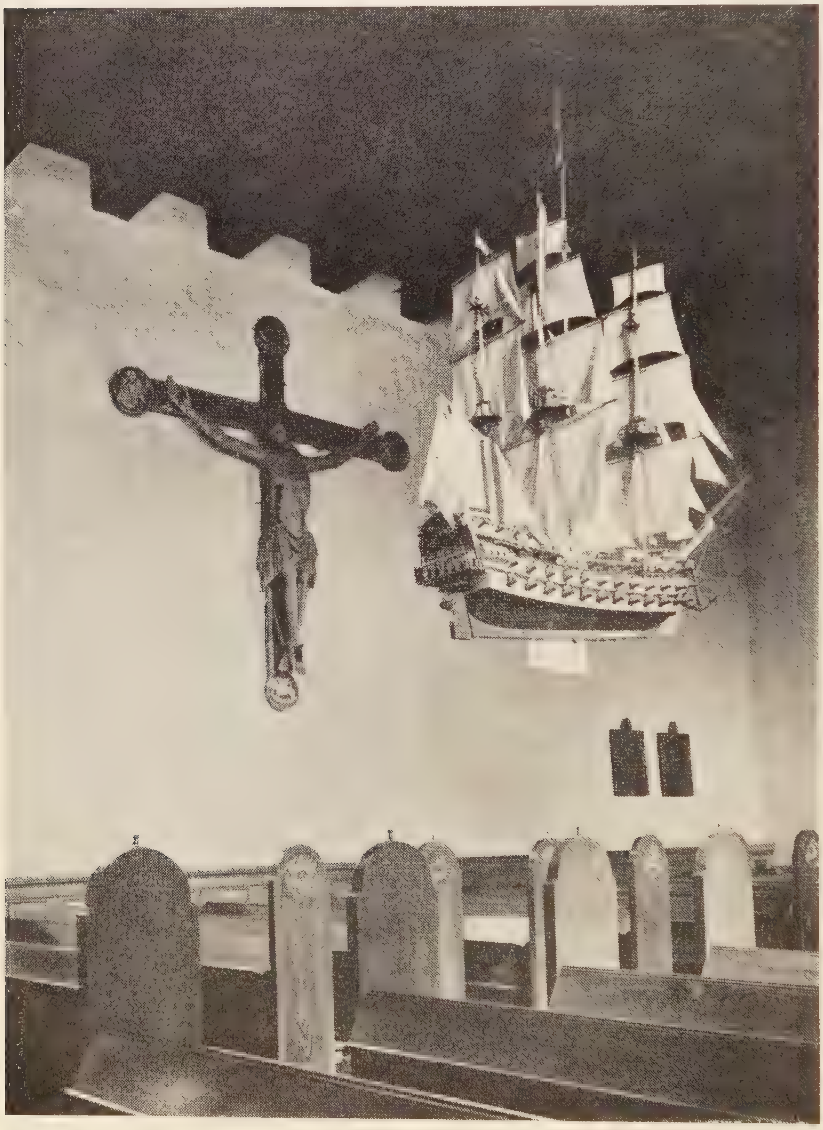
Proportionately the largest number of ships are in the churches of Funen and neighbouring smaller islands: namely, nearly 200. Funen itself has about 215 churches in all. In the days of sailing ships this was a busy shipping district.

The types used are nearly always sailing ships. The oldest are usually warships, but from a later date there are also merchantmen, most often frigates or barks, but also brigs, schooners, ketches, and even lightships, pilot vessels, fishing vessels, and lifeboats. But modern steam and motor vessels are never seen. In this respect the custom has become traditional.

In length the models vary from 19 cm to 335 cm (7½ ins to 11 ft), measured from stem to stern, but the

Typical ship model in Rørup Church (Funen)


A beautifully made model of a herring boat, about three feet long, in Nibe Church, North Jutland (1703)


Typical ship model in a church: the man-of-war "Jomfrue Hedevig Suleima", 135 cm (4ft 5ins) long, in Hillerslev Church, North Jutland (eighteenth century)

majority measure between 75 and 150 cm (2ft 6ins to 5ft). Although perfect "museum pieces", timber-built to scale, are rare, a good many of the models are fine work. A number of the earliest ships are "optically" built with under-dimensioned hull and over-high rigging, over-long cannon, and over-big flags and pennants; when seen from the floor of the church high up under the roof they look quite natural. Usually, the church ships present a fine sight as they sail forth in the church in full sail with flags flying and with their figureheads and ornaments, anchors, and other fittings. By old custom they point their bows towards the altar.

Papers in the Hold

In the holds of most of the models are ships' papers giving information about the builder and donor, together with other data. Sometimes these papers are beautifully hand-written on parchment. They are usually in metal or glass containers.

The builders, as a rule, have been persons associated with the sea, while the donors may be from any social level, from the poorest fisherman to the King, from the convict to schoolchildren. Many, of course, have been given by seamen, either singly or jointly; thus 25 per cent of all the models have been presented by associations of seamen, fishermen, and the like.

Although they hang high up, untouched by human hand, the models in time decay. Large numbers of them have for this reason been removed and lost, while others have been restored by more or less skilful hands. Some ships are taken down for inspection at regular intervals of, say, eight, 10, or 25 years. Unfortunately, many have been impaired by unskilled restoration, the rigging of many an old model, for example, being of a more recent type than the hull.

To Church in Procession

At many places along the coast it is the custom for newly presented ships, or old ones which have been restored, to be taken to the church in solemn procession. In Roman Catholic countries there are annual processions of votive ships down to the beach, where the priests bless the sea and shipping, but these cannot be directly compared with the Danish processions, which seem to be of domestic origin. The model is carried by seamen in festive dress—white shirt, sailor's collar, red sash, and black trousers—or uniform; and the procession is led by a "pilot", who gives his commands in maritime fashion. There are flags and music, and the ship is followed by seamen and others, walking in ranks, and mostly wearing civilian dress. Salutes are fired on the way, and flags are hoisted all over the town. The route is through the streets down to the harbour and back to the church, where the pilot hands over the ship to the minister with a set speech: "I herewith strike the flag and deliver the ship to the church free from chips and scratches, and request the minister to protect it from fire and other damage." The minister accepts it on behalf of the church, and, after it has been hoisted into position, preaches a sermon in which he explains the symbolism of the ship.

Church processions of this sort are recorded well back in the eighteenth century, and are known from over 50 different towns and fishing villages. This custom, too, seems to be becoming increasingly common, though hardly in parishes where there are no sailors or fishermen.

Unusual Shipping List

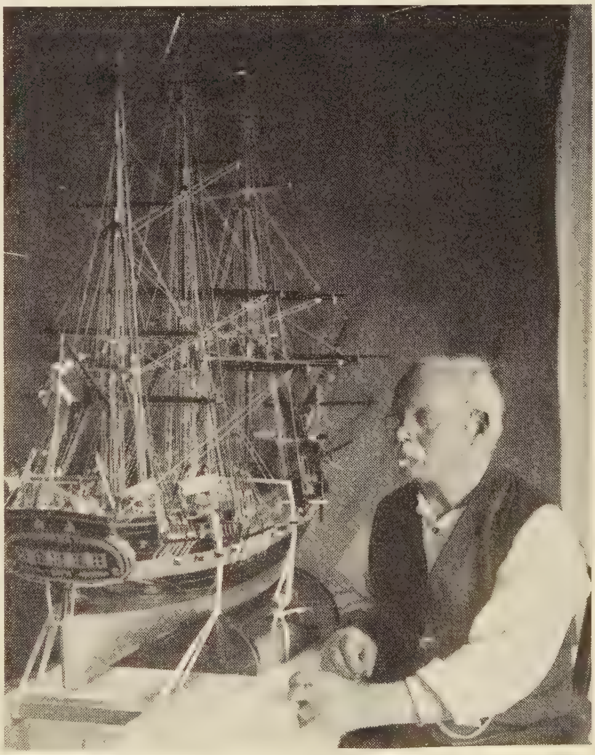
The central Danish museum of maritime history, the Commercial and Maritime Museum at Kronborg (Elsinore), began after the last war to collect information about Danish church ships. Questionnaires were circulated to all churches, requesting the following information: type and name of ship, construction and appearance, length from stem to stern, whether a model of a definite ship, ships' papers, inscriptions and inscribed dates, together with details of builder and donor, date of erection, and any other available data about the ship and its history, in particular the reasons for its presence and any traditions and legends relating to it, and of any procession when the ship was installed. The information thus collected is kept in the museum, which has published surveys of the material in book and monograph form. Work is constantly in progress in order to keep the files up to date by the inclusion of material about newly installed ships.

A Cold Pastime

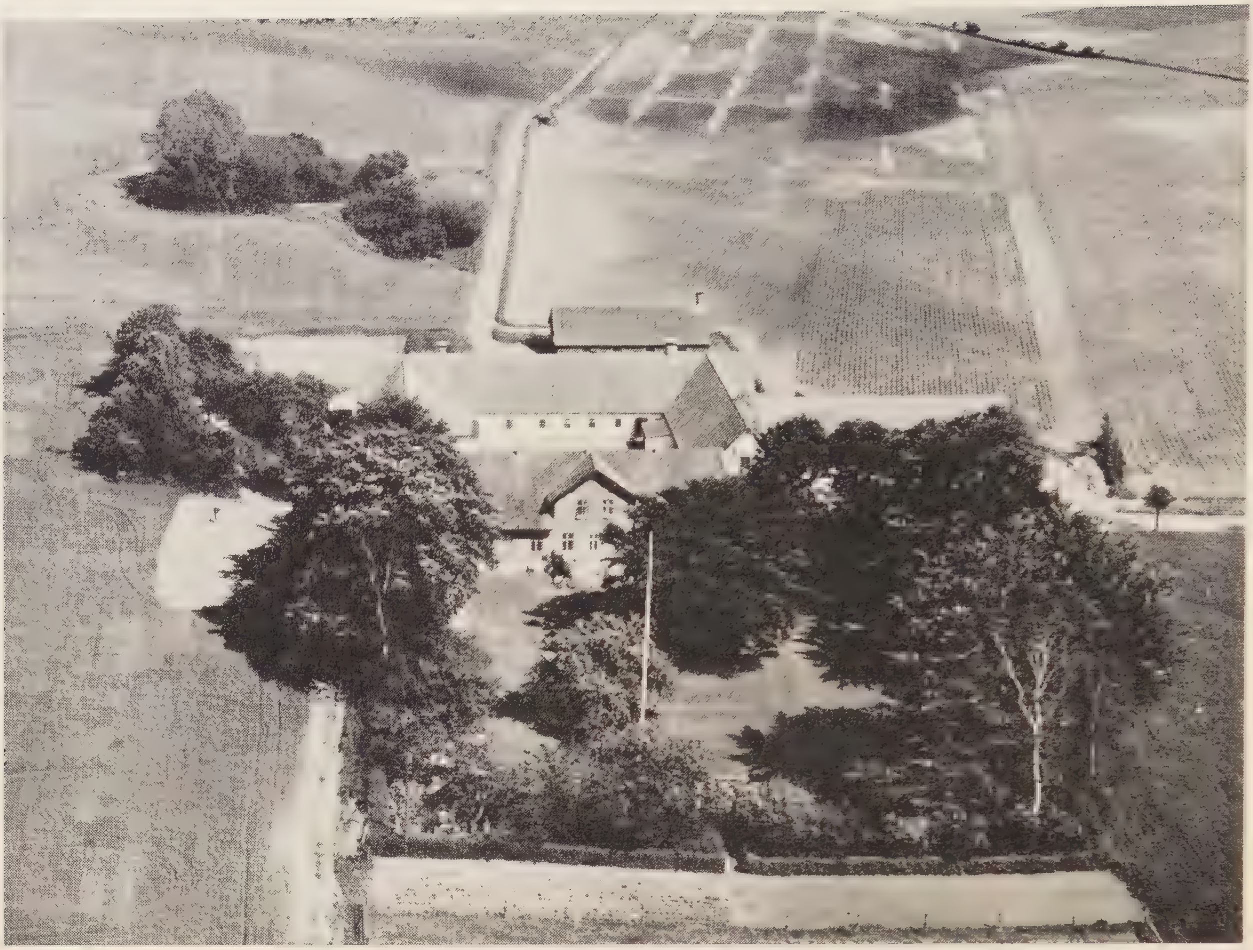
It is interesting that the hanging of ship models in churches is so vital a tradition, and the installation processions are a striking testimony to the country's, and the people's, link with the sea and shipping. There are other colourful traditions which are still observed by seamen in Denmark, in particular two popular Shrovetide customs. One is a boat procession, led by a boat on wheels, in which are a uniformed "admiral" and sailors, and with flags, a band, and many popular comic figures in the procession; and the other is a jousting tournament which takes place in boats, often in the ice-filled harbour, and in which the object is to tip opponents into the water. Occasionally, the church ships will be introduced into these purely secular processions.

The customs mentioned remain alive, whereas most other traditional customs are either disappearing or have been lost. The present time does not encourage the keeping of traditional festivals: all the more reason why we should be grateful for the preservation of at least a few of the most interesting and colourful folk processions.

Sailors from the Royal Yacht "Dannebrog" carrying a model of the ship "Justitia" in procession to Strandby Church, Jutland (which is the church attended by the Royal Family when they are staying at the hunting lodge at Trend, usually at Christmas and Easter)



An experienced builder of ship models for churches: Captain B. Clausen Jensen, Ribe, with a model of the frigate "Rota" for St. Catherine's Church, in his home town



Air photograph of Nordgården, near Allindemagle in central Zealand, surrounded by its 45 hectares of not very good land. In the foreground is the main building, with the cowsheds and stables, pig-sties and other out-buildings behind. On the left is the barn

Princess Margrethe's Farm

By Knud Ravnkilde

Public Relations Officer, the Agricultural Council

Among the many gifts received by Princess Margrethe, the heir to the Danish throne, on her eighteenth birthday last April was a farm complete with cows and pigs, presented free of debt by Danish farmers. Deliberately not a show-piece, the farm is, in size, history, appearance, and day-to-day work, a typical example of the 200,000 Danish holdings

Although the Crown once possessed some 40 per cent. of all the land in Denmark, no king since Frederik VII (1848–63) has personally owned a farm. Now, if not the king, at least the heir to the throne is to go "back to the land". Princess Margrethe, eldest daughter of King Frederik and Queen Ingrid, received on her eighteenth birthday, April 16, a typical Danish farm given by the Federation of Danish Agricultural Societies. Nordgården, as the farm is called, is situated near the former royal residence town of Ringsted in central Zealand, on land which belonged to the Crown down to 225 years ago.

In the eighteenth century an inevitable development set in. The control of the land by the Crown and estate owners had to be relaxed, so that the farmer could be emancipated and national prosperity be based on his labour. How things have changed when, as now, the farmer shows his devotion and loyality by "surrendering" land to the royal house!

Reflects Agricultural History

Nordgården is the smaller of two large holdings in the parish of Allindemagle, the rest of which consists of small freehold farms. The new owner should be particularly welcome in this area, for here another woman of blue blood heralded the peasant emancipation. In the eighteenth century the local farms belonged to the manor of Skjoldnæsholm, and after the owner's death in 1762 his widow kept it on until 1794. Intent on relieving the burdens of her tenants, she cut down their compulsory labour services in the manor fields, reduced their economic liabilities, and wherever possible permitted sons to succeed to their fathers' holdings.

At that very time the best men in the nation were concerned at the fall in the standard of living, due to an expansion in the population without a corresponding increase in production. The manors obtained better results than the tenant farms and it was necessary to provide the farmers with better opportunities to make more of their land. What they needed was greater independence and the consolidation of their plots. In Allindemagle, for example, a single holding was split up into more than 100 strips, so that rational farming was out of the question.

In 1788 the system of adscription, which prevented a tenant from leaving an estate without permission from the owner, was abolished. The measure ushered in a period of rural reforms which included the gradual remission of tenant liabilities to the estate-owners and the extensive consolidation of individual holdings. The consolidation of plots began at Allindemagle in 1797, and was completed five years later. The lands of all 14 farms were consolidated, but only five of them moved out immediately to their holdings; the rest remained in the village for the time being and were transferred later. One of the five was Urnegården, owned by Ole Hansen, the farm which in 1895 was renamed Nordgården.

Thus the history of Danish agriculture is reflected in the history of Nordgården; and Nordgården also reflects the achievement of Danish farming from emancipation down to today.

A Proper Farm

It was not the donors' wish to present the Princess with a show-piece. They wanted her to have a proper farm that would be the fruit of labour and a sign of life. King Frederik and Queen Ingrid were informed of the plan in advance and inspected the chosen farm with almost as much pleasure as Princess Margrethe showed when taking possession a month after her birthday.

Nordgården, with whitewashed walls and red roofs, displays the national colours, only the farmhouse itself being all red. In consultation with her mother, the Princess has started to furnish it. The buildings, forming a square round a central courtyard in the Danish custom, are from five to 40 years old. The 200,000 Danish farms and smallholdings average 15 hectares (37 acres). Nordgården has 45 hectares (111 acres), which is the average of the medium-sized farms typical of Danish agriculture. The quality of the soil is roughly that of most other farms: it is not outstandingly good but it is admirably worked and fertilized.

It is a general mixed farm, relying on the use of its own crops supplemented only by oilcakes and similar concentrates which Denmark is unable to produce. There are about 20 cows—a number which will eventually be increas-

Princess Margrethe inspecting her farm, seen in the background

The Princess is received with flowers

ed by five or six—and a score or so of young cattle. Each year between 170 and 200 pigs are delivered to the local cooperative bacon factory. Incidentally, the cattle were an extra gift and contrary, in a way, to the desire that the holding should be an average one, the cows, of the Danish Red Dairy breed, being some of the best. No cattle had been kept by the previous owner of the farm for some years, and when a herd was sought it so happened that there was a first-rate one on the market owing to the death of the owner. It was an opportunity not to be resisted. Each cow in the herd gives 5,000 kg (11,000 lb) of milk and about 275 kg (roughly 600 lb) of butter a year.

When the Princess entered two of her red heifers at the big annual show at Bellahøj, Copenhagen, in June this year, each of them won a first prize.

Less Manpower, Fewer Horses

There are no poultry on the farm, but this omission will also be repaired in due course. Eggs and poultry have continued to fetch reasonably good prices in the world market, a fact which has brought some consolation to Danish farmers during the recent crisis in the butter trade.

The day-to-day running of the farm has been entrusted to a young manager and his wife, Mr. and Mrs. Jørgen Pilegård, assisted by a herdsman, a farm-hand, and a maid. Only 10 years ago there would have been at least another man. But rationalization and mechanization by means of tractors and other measures have been carried out to the utmost extent allowed by the economy. Once again, Nordgården reflects the general trend of Danish farming. The drift to the towns, and still more the need to economize owing to steeply rising costs of production, have reduced the agricultural labour force from 25 to 20 per cent. of the population since the war. At the same time the number of horses has dropped from over 600,000 to about 250,000, while there are 80,000 tractors as against 5,000 at the end of the war, and 130,000 milking-machines compared with 36,000.

Partner in a Movement

Under a system of crop rotation the crops of the different fields are changed yearly according to a carefully laid plan which takes account of the nature and condition of the soil. Characteristically Danish is the large production of fodder, especially beet.

It is a fact established by others besides Danes that Danish agricultural production, quantitatively and qualitatively, leads the world, though soil and climate cannot compare with those of most of Denmark's competitors. This is not to say that the Danish farmer's industry and general qualifications are better than anyone else's. The explanation may equally well lie in the simple fact that conditions have forced him to give his best if the country is to pay its way. One qualification which the Danish farmer probably does possess more than most is education and an appreciation of the value of partnership, given to him at an early date by the folk high school movement. Its chief practical results have been the cooperative societies and the agricultural organizations.

The significance of all this is that Princess Margrethe, besides her staff of workers on the farm, will as partners have 20 per cent. of all Danes—the entire rural population—and will join with them in achieving innumerable common objects. She has lost no time in joining the local agricultural society, and so will be able to avail herself of the services of 15–17 advisory officers, each a specialist in some agricultural subject, such as vegetable crops, cattle-breeding, farm accounts, hygiene, building, and so on.

The Princess's herd is under regular veterinary inspection, the yield of each cow is recorded by the local milk-recording society, and breeding societies are helping to improve the stock. In practically every department of production there is an association which aims at reducing costs and raising quality.

The net result of all this as regards Nordgården is difficult to arrive at. But taking the official figures and reducing them to the scale of this farm, we get interesting information which will help us to assess the value of the Princess's farm to the nation.

Two-thirds of Danish farm production is exported, the remaining third being consumed at home by the 4,500,000 Danes. This means that a Danish farm, through its livestock, produces per hectare ($2^1/_2$ acres) sufficient food per day to feed five well-fed people. Which, in turn, means that Princess Margrethe feeds 225 persons. Two-thirds of these, or 150, are foreigners, with the British and Germans as the biggest individual groups, but with others represented all over the world.

Acute Problems

Yet there is one other fact which should be mentioned, and it is one which may surprise the reader most of any. Neither in production nor in exports is there any form of Government subsidy, guaranteed market prices of general farm produce are unknown, and farmers get no protection from foreign competition through import restrictions or tariffs. From all these things, which cost the general public of many other countries vast sums of money, the Danish public is spared.

However, subsidies and protective measures in customer countries have created problems which have now reached an acute stage. The strongest manifestation of this is the fact that the price of butter has fallen to the level of margarine, with the result that butter production is being carried on at a loss. Countries which once were large importers of butter are now exporting it, thanks to an expansion in production due to subsidies, generally coupled with restrictively high prices in the home market or—as in Germany—a complete embargo on imports. The situation has become grotesque, because the new exporters are able to sell their butter at extremely low prices as their treasuries cover the loss.

The fact that there is no prospect of a healthier arrangement of agricultural conditions which would facilitate free and equal competition is the gravest problem the Danish farmer has yet had to face.

Vocation and Way of Life

Is the position of "Farmer Margrethe" and her colleagues on the 200,000 holdings an enviable one?

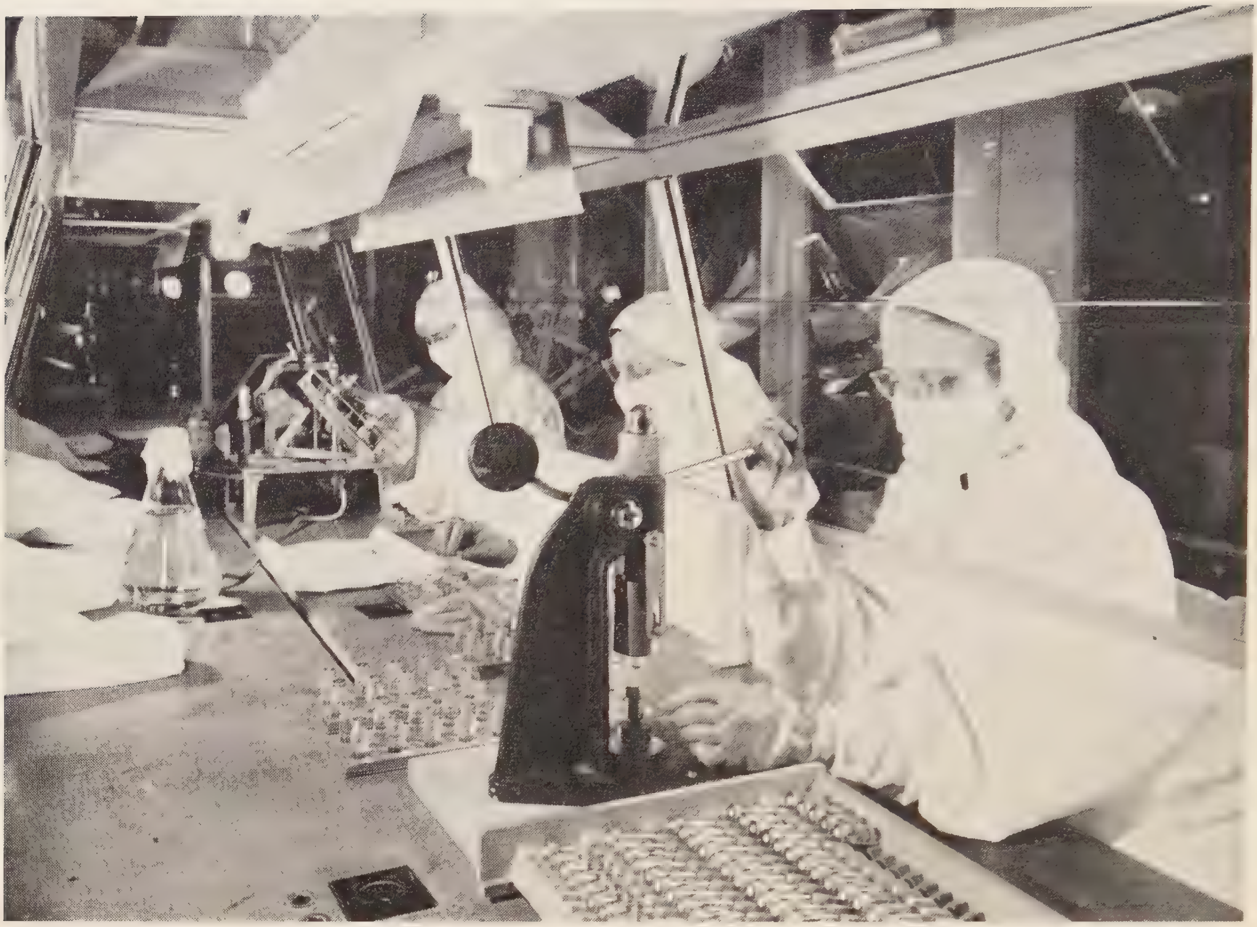
Before the marketing crisis set in last year in earnest the owner of a farm like Nordgården could make a profit of between 20,000 and 25,000 kroner, corresponding to a return of something less than 100 kroner on the food supplied to the 225 customers mentioned above. Personal taxes would take 5,000 kroner of this amount.

From the financial point of view there is little cause to envy her colleagues—considering the effort, the output, and the invested capital. Of course, the Princess has received her farm unencumbered by debts; she will thus be spared the costs of interest and other important charges. The holder of a similar farm will usually have it mortgaged for at least a third of the value, and will have to pay interest on the mortgage. True, the mortgage societies belong to the farmers, so that interest rates are low; nevertheless, interest charges are a large item of expenditure. Farmers who have bought their holdings during recent years have, generally speaking, a much bigger mortgage and are often far more vulnerable to crises like the one threatening. The Danish farmer works hard most of the year, but he likes it. A well-known farmer, speaking recently, said that his was not only a vocation but a way of life. As a farmer's song has it: "We will not change it for that of kings". So, at least in the eyes of farmers, Princess Margrethe should have an ideal life!

The whole of Denmark will watch the future of Nordgården and its charming owner with the greatest interest. All hope that the Princess will feel at home whenever she finds time to stay there, and that there will be a bright future for her—in a dual sense—"royal products"!

Unfortunately, some people have shown such an intense interest in the farm that it has been necessary to put up the sign, so unusual on hospitable Danish farms—"Admission Strictly Prohibited".

The new farmer, Princess Margrethe, examining her pigs (together with her lord in waiting and the secretary of the Federation of Danish Agricultural Societies)



Antibiotic products are packed under absolutely sterile conditions. Here a streptomycin preparation is being packed in glass containers for export

Pure Drugs

By C. Treschow, Dr. agro.

From a modest start nearly fifty years ago the Danish pharmaceutical industry has developed on a considerable scale - compared with the country's chemical industry as a whole. Besides meeting about two-thirds of the domestic requirements of pharmaceuticals, the industry carries on a large export trade, which in 1957 amounted to about 105 million kroner spread over some 70 countries. The total production of the industry the same year was just over 170 million kroner

Denmark has few of the many raw materials used in modern pharmaceuticals and none of the synthetic chemical industries producing, for example, dyestuffs, which have been such a fruitful source of new drugs in many other countries.

As an agricultural country, however, she has bacon factories and slaughter-houses able to supply the drugs industry with considerable quantities of animal organs and by-products, and, in association with scientific experts, it soon developed many fine drugs from them. Danish insulin established itself as one of the best insulins on the world market, and many other hormone drugs and products followed in its wake. Their quality was so high that they have been employed as international standards.

Organized Research

The advent of sulphonamide drugs in the late 1930s caused the emphasis in international research on new drugs to be switched to synthetic medicine. The Danish industry, which by then had built up a highly qualified research organization, had a successful share in this development. In the intensive work of finding new and more effective sulphonamides valuable drugs were produced by original Danish research and could be exported to a variety of countries.

Combating Ill-health

Alongside the intensive development of synthetically produced drugs a new, biologically based field was explored during the war: namely, the production of drugs from micro-organisms, the so-called antibiotics. Danish production of penicillin began before the end of the war—following extensive research—and soon other antibiotics were also being made. These valuable drugs have since been exported on a wide scale.

A description of the rapid development which has taken place in the field of drugs during the last 10–20 years is outside the scope of this article. Nor is there space to detail the products which have been developed by Danish research and are now used in combating ill-health both in Denmark and abroad. In this period the Danish pharmaceutical industry has displayed a versatility that would never have been dreamt of 20–30 years ago.

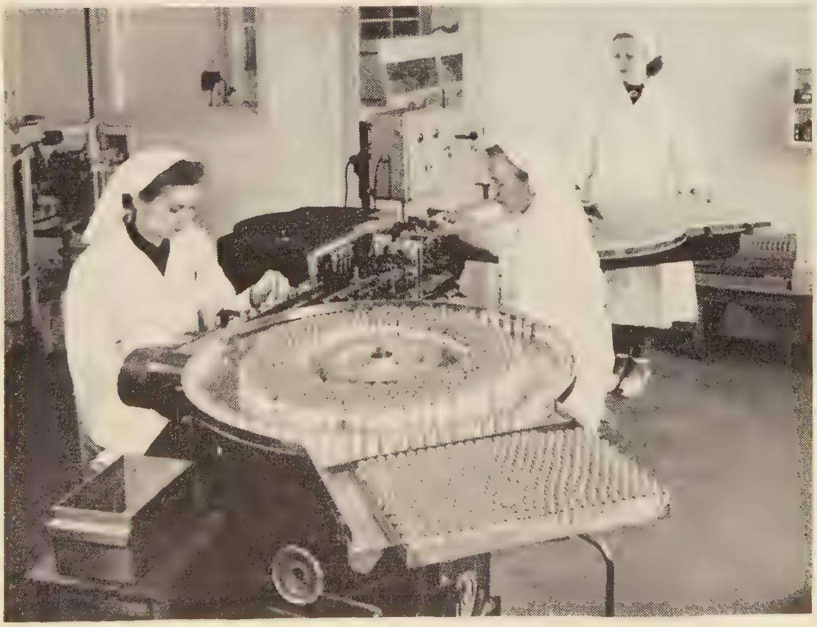
Danish research has led to the development of new diuretics, tranquillizers, anti-tuberculosis drugs, and the alcohol deterrent Antabus: to name but a few of the Danish products which are internationally marketed in the synthetic drug group. Extensive and involved industrial syntheses such as the production of adrenal cortex hormones have also been successfully carried out, and the most outstanding among these are now made both for the home market and for export.

A Competitive Industry

Besides a considerable export of insulin and other organo-therapeutic drugs, which in 1957 amounted to 22,800,000 kr. and 6,800,000 kr. respectively, there has been a big post-war export of antibiotics, totalling in 1957 47,600,000 kr. In the field of vitamins, which Danish industry entered at an early date, the export figure in 1957 was 12,100,000 kr. Exports under the heading miscellaneous synthetic drugs, etc., totalled 15,600,000 kr. The last figure proves the ability of the Danish industry to succeed in the international market for synthetically produced drugs and shows that it is possible to make up for the lack of available natural products by means of highly developed technical scientific research.

The Danish drug industry, according to the official statistics, numbers 15 commercially run factories. In addition there are three Government-operated establishments: the State Serum Institute, the State Veterinary Serum Laboratory, and the Lindholm Research Station. These are not actually factories, but they have an industrial-scale production of vaccines, serums, and the like, some of which is exported (in 1957: 500,000 kr.). The three Government institutions have been of very great importance to public health. This has made them known far and wide and has helped to give Denmark a reputation as one of those countries which have made the greatest contributions toward combating and preventing ill-health.

Tablets are produced by means of high-capacity rotary tablet-machines. This machine can turn out 50,000 tablets an hour



Labelling machine in operation

A good haul of Bornholm herring

All the Best from the Sea

By Poul F. Jensen
Director of the Industrial Inspectorate, Ministry of Fisheries

The title is one of the slogans of the Danish fish trade. The truth of the statement it makes is based on the quality inspection which – like the inspection of agricultural produce – is carried out at every stage of production – from the moment the fish is hauled out of the sea until it lies on the kitchen table

"The high standard of Danish fish is probably one of the main factors which have enabled Denmark to find an outlet abroad for its increasing production. The reasons contributing to this high standard of quality are, apparently, education of fishermen and exporters, proper transport equipment, and governmental control."
(C. L. Cutting: *Fish Saving. A History of Fish Processing from Ancient to Modern Times.*)

In proportion to the size of the country, Denmark has the most extensive fishing waters in the world. Danish fishing vessels plough the waters of the North Sea and Baltic, the Skagerrak and the Kattegat, and a great number of belts, sounds, and inland waters.

The annual catch totals about 423,000 tons and is worth about 240 million kroner. Nearly half of the amount comes from the North Sea. The largest group is flat fish, of which about 75,000 tons is caught, but the catch of herring, sprats, and mackerel is nearly as great and about 30,000 tons of cod, haddock, and similar fish is caught, besides eel, salmon, other varieties of fish, lobsters, and shrimps.

Fishing off Greenland is a chapter by itself. Here the catch principally consists of cod and halibut, and there is some hunting of seals and whales.

Ground-net fishing exceeds other forms of fishing (trap, trawl, seine, and hook) in volume and value.

The fishing fleet comprises some 22,000 vessels, the largest of which exceed 50 g.r.t., the smallest being under 5 g.r.t. The total value is estimated at about 184 mill. kr. About 12,500 persons fish for a living. Plaice gives the biggest return, and large hauls of this fish are made on the Dogger Bank in the North Sea.

The export value of Danish fish is about 181 mill. kr. per annum.

Guaranteeing Freshness

Getting the fish delivered in good, sound condition from the fishing grounds and ports to consumers at home and abroad presents certain problems. Not only must it be fresh, it should also preserve its full nutritional value and flavour as well as its appetizing appearance. It should also be available at a reasonable price.

The desire of fishermen and the trade that these problems should be solved led in 1954 to the passage of a special law controlling the quality of fish and fish products. Although its provisions cannot be directly applied to conditions in other countries, they can be adapted to them.

The law takes in all trading in fish and fish products and all forms of industrial processing of fish, catching, storing, transportation, freezing, etc., and it applies both to exports and domestic supplies. The term "fish and fish products" includes shell-fish and other sea-food and products of inland waters.

The law prohibits the processing of any fish which is in poor condition: that is to say, fish that is declared unfit for human consumption or is not absolutely fresh owing to some defect in icing, packing, or other handling. The inspection guarantees that the fish will reach its destination in good condition.

The decision as to whether a consignment of fish is absolutely fresh in every respect must sometimes be a matter of opinion. The law therefore prescribes that the judgment of the inspectors may be appealed against to the Ministry of Fisheries Complaints Committee in the case of frozen, salted, smoked, or canned fish. Such action is not possible in the case of unprocessed fresh fish owing to its very limited keeping quality, and consequently the decision of the inspectors in this case is final.

The Complaints Committee comprises one representative of the Ministry, one from the Ministry of Fisheries Research Laboratory, and three from the fishing industry, two of these being appointed by the trade association involved in the complaint.

Laid in Ice

The law contains provisions governing the storage and transport of fish and fish products, the cleaning and maintenance of vessels and premises, catching, marketing, and processing: in short, every stage from fishing to arrival on the kitchen table in fresh or processed condition.

Regulations covering the stowage of fish on the fishing vessels ensure that the bottom layers are not spoiled by those on top. Herring is particularly subject to damage from pressure, and so it is prescribed that herring for human consumption must be boxed immediately after catching unless it is landed within 24 hours.

Wet fish is one of the most perishable of all foods. Consequently, the regulations require it to be iced. The installation of freezing plant is a costly procedure, but it pays.

Fish which is not landed live must be gutted immediately after catching. During transport it must be carefully protected against wind and weather and must never be uncovered in rain or sunshine.

Trained Personnel Only

It is an important provision of the law that fish and fish products may not be marketed in conditions which give misleading information about variety, origin, quality and quantity, production, food value, etc. Every exporter and processor must sign a declaration to this effect.

The law also contains various provisions governing the retail trade, equipment of fish shops, etc., and prohibits processing—salting, smoking, drying, freezing, canning, filleting, etc.—except in unauthorized premises, where only trained personnel may be employed. Precise rules concerning the temperature of cold stores are also laid down.

Fishery Inspection

A special committee—the Ministry of Fisheries Quality Committee—assists the Minister to enforce the provisions of the law. It consists of five representatives of the trade, one from the public health authorities, and one from the Ministry.

The day-to-day administration of the law is the responsibility of the Fishery Inspection, and a blend of centralized and decentralized administration has been found to be the most effective form. The inspection of fish and fish products takes place at landing ports and factories, while matters requiring technical, chemical, or bacteriological research are dealt with at a central institution.

The country is divided into 39 inspection districts and there is a fishery inspection station in every important fishing harbour and port of export. The largest station is at Esbjerg, where there are 12 inspectors headed by a chief inspector. Together the inspection stations are under the charge of three chief inspectors, responsible for large areas. Fishery inspectors are usually recruited among young fishermen with some training in seamanship. Promotion to the higher grades is by special examination.

The industrial processing of fish is also inspected by the Ministry of Fisheries Industrial Inspectorate. This is where the centralized part of the administration comes in. The inspectorate has its offices and laboratory in Copenhagen. The technical personnel pay frequent visits to industrial establishments in order to inspect production, when they deal with various matters jointly with the Fishery Inspection.

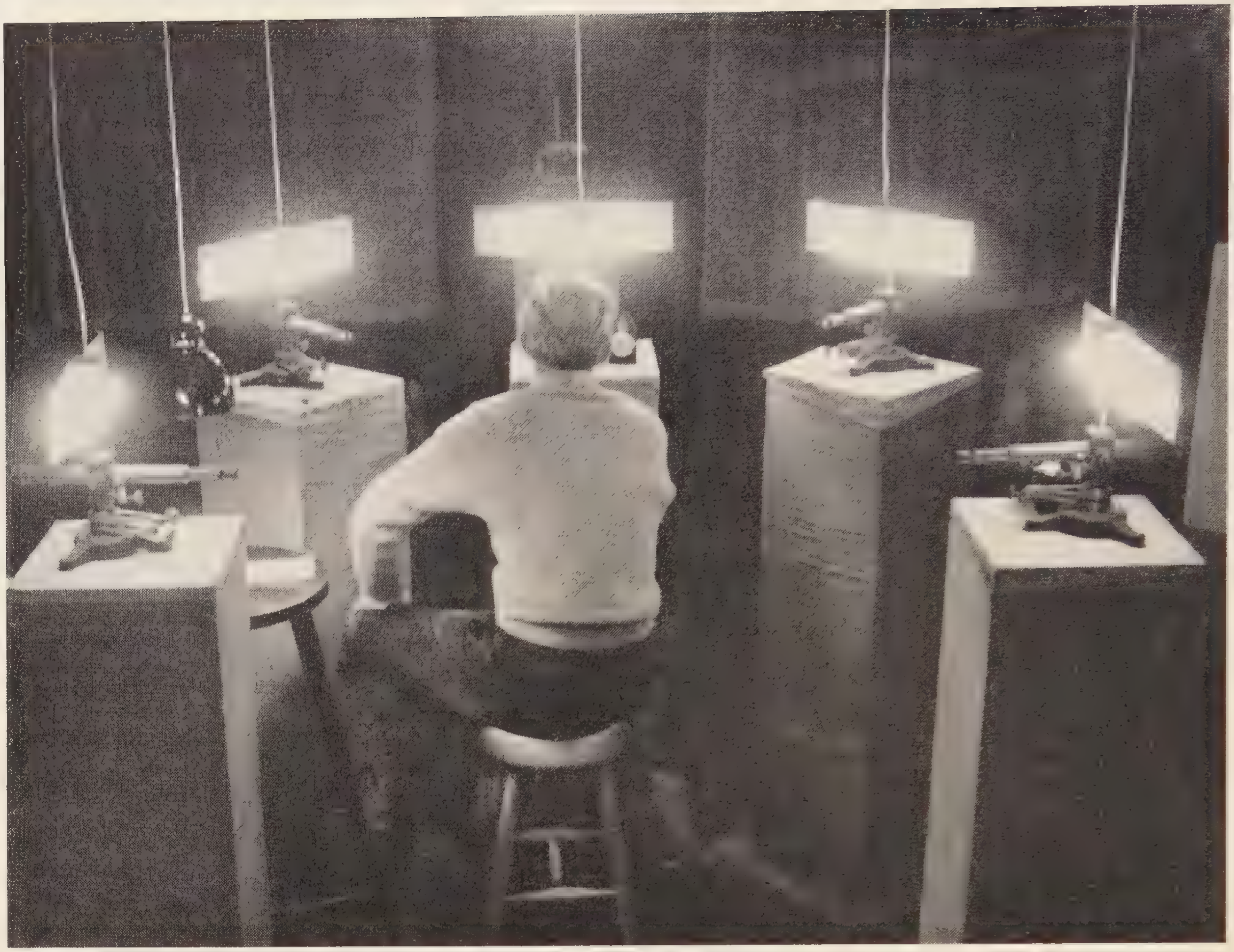
Reliable Products

It should be added that the Ministry's Research Laboratory also provides technical guidance for industry. If there are complaints from the inspecting authorities, the establishment concerned may seek the advice of the laboratory in solving its special problems. This advice is usually given free of charge.

The Research Laboratory also assists the Fishery Inspection in special bacteriological and other research requiring technical equipment.

From these legislative details it will be understood that great care is taken in handling the annual Danish catch of more than 400,000 tons of fish, and that the quality of Danish fish and fish products is absolutely reliable.

Scooping up the riches of the sea



Inspection of Variometers – instruments for measuring magnetic fluctuations

Measuring the Earth's Magnetism

By Kristen Hesselager

Sensitive instruments for measuring terrestrial magnetism and other geophysical phenomena are in permanent service at the magnetic observatory near Copenhagen. Here also a large number of apparatus are tested by the Danish Meteorological Institute, which operates this and similar observatories in Greenland, and which exports the instruments to places all over the world

Beads of perspiration stand out on the engineer's bare torso, for the temperature in the small room where he is testing scientific instruments is 105° F. He is not over-worried by this, because sometimes he has to work at temperatures of more than 120 degrees. Sometimes, also, his hands and feet will tingle with cold, in spite of warm pullovers and thick socks, because the instruments have to be checked in many degrees of frost. But today the heat is tropical. It is produced by special electric heaters; not because of any particular theories about heating, but for the simple reason that stoves and radiators are as unwanted as foxes in a hen-house. The instruments have been designed to measure the earth's magnetism, and in the magnetic observatory, which stands isolated in a wood near Copenhagen, iron and steel are so completely banished that nails and screws, hinges and locks are all of non-magnetic metal and employees must empty their pockets of keys and clips before entering, deposit their steel watches, wear cuff-links which contain no trace of iron and change their shoes if these have steel supports.

Besides the instruments which are in permanent use at the observatory for measuring magnetic variations, there are many more that are tested here for the Danish Meteorological Institute, which operates this and other magnetic observatories in Greenland, and which exports the instruments to places all over the world, from the Equator to the Poles. At least a hundred other observatories have been equipped with Danish instruments, as have many stations and expeditions which are carrying out scientific measurements in connection with the International Geophysical Year, ending at the New Year.

Built for Last Geophysical Year

It is a remarkable fact that these instruments were designed 25 years ago, some for use in the last geophysical year, 1932–33. They were designed with such brilliance by the then director of the anish Meteorological Institute, the late Dan la Cour, that few alterations have been necessary.

The measurement of terrestrial magnetism and similar physical phenomena is an important feature of the scientific work being carried out in the Geophysical Year. Not only does the force of terrestrial magnetism vary from place to place owing to variations in the earth's magnetism itself, but it is also subject to variations in the same area owing to variations in the subsoil. Minerals contain magnetic metals in varying degrees, and a sensitive magnetic instrument will give valuable information about them. It is possible, for example, to distinguish between granites with differing magnetic properties, and the result may have both scientific and practical importance.

Denmark produces portable instruments for such measurements, two different types being used, one for horizontal the other for vertical magnetic force. The first of these is known as a quartz horizontal magnetometer (QHM), the other, by a French name, as a *balance magnétométrique zéro* (BMZ) —an odd illogicality of nomenclature which can occur in the most exact science.

Magnetic Storms and Sun Spots

And at frequent intervals a consignment is despatched to somewhere near or distant. Of QHM instruments Denmark has already sold about 500, 400 of these since the war and many of them for the present Geophysical Year. A large consignment was recently sold to the Soviet Union. Some of the scientists who employ these instruments in their work do so in scorching heat, others in intense arctic cold.

The magnetic forces present at any particular point do not remain constant but fluctuate continually, mainly in relation to solar phenomena. From time to time there are magnetic storms which cause the instruments to oscillate violently. There is a connection between these magnetic storms and sun-spots. These are chiefly of scientific interest, but have acquired large practical importance because the currents emanating from the sun affect the ionosphere which reflects radio short waves, and so play an important part in radio reception. These fluctuations are measured by means of variometers.

Photographing the Oscillations

It was la Cour's merit that he not only designed these instruments but also invented an outstanding registering apparatus. The forces affecting the magnetic needle, which is often only a centimetre in length, are extremely weak, and the oscillations of the needle have to be transmitted to the registering apparatus photographically via a mirror. A brilliant feature of la Cour's principle was his success in getting the photographic paper to pass through the apparatus twelve times as rapidly as in normal registering, and without the use of extra paper.

Skimming with a Graphite Ladle

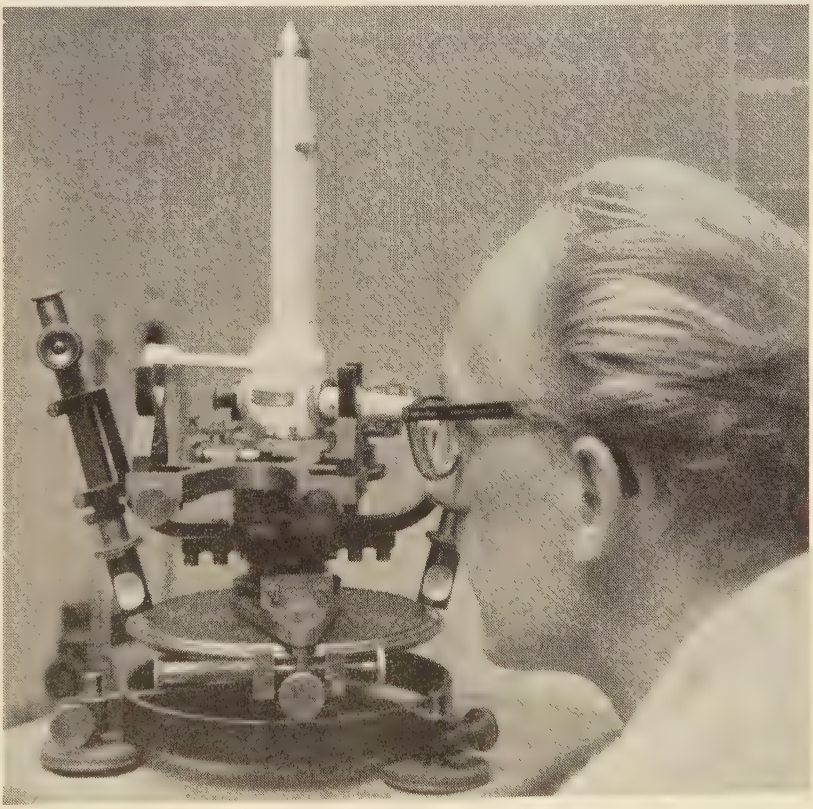
The precision of these instruments is laid in their production. This begins in the foundry, where the metal, an alloy of iron-free bronze, is cast. Special moulds and a special sand are used, and a graphite ladle is employed for skimming off the dross which floats on the surface of the smelted metal. The microscopic attraction of the iron ladle normally used in a foundry cannot be tolerated.

The metal is made up at an instrument works in Copenhagen which makes many kinds of scientific and medical instruments, the tools here being of phosphor bronze, down to the screwdrivers. The works produce all their own parts for the instruments, the smallest screw being absolutely iron-free. They have even gone so far as to set up their own paint works, in order to ensure that no iron slips into the instruments through the paint. All tools are thoroughly cleaned before drilling and turning begins. Some of these must be of steel in order to provide sufficient hardness, and care is then directed to removing the almost invisible shavings produced during the processes. The utmost accuracy is observed, down to tolerances of a thousandth of a millimetre, and the instruments are made resistant to any fluctuation of temperature, the same apparatus being serviceable at temperatures ranging from 50° to minus 50° C. (approx. 120° to minus 60° F.).

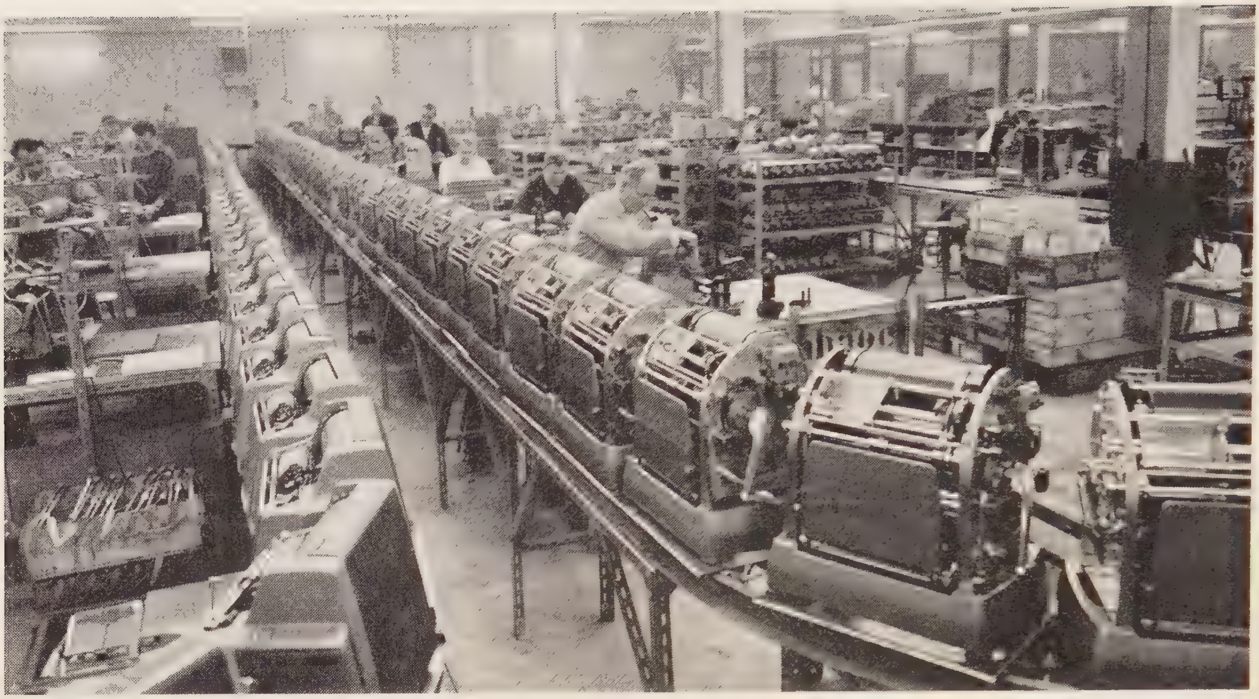
Scientist Twists Quartz Thread

The final process of testing and adjusting the instruments takes place at the magnetic observatory. In the case of the QHM instrument and two types of variometer the magnet is suspended in a twisted quartz thread, which the meteorologist in charge of the observatory prepares at home. Quartz has very delicate and elastic properties, and the principle underlying this suspension is that the force by which the horizontal field of the earth affects the magnet is balanced by the twisting of quartz thread.

The instruments thus end where they began, in the laboratory, and their production is the result of fine team-work between science and mechanical ingenuity.



Testing a Quartz Horizontal Magnetometer (QHM) before passing it for export



The Danish office-machinery industry is expanding: these are duplicators on a conveyor

Office Machinery Makes the Grade

By Georg Mynster

The United States, home of modern office machinery, has rapidly become the biggest customer for Danish office machines. A Danish duplicator of striking design, which introduced a new printing technique, has greatly extended the scope of this machine

Danish makers of office machinery wisely decided after the war to concentrate on certain specialized lines. They realized that to be successful in the world market they would have to combine high-class Danish craftsmanship with rationalized methods of production in order to compete in both quality and price.

Exports therefore concentrate on four main types of machine: duplicators, dictaphones, computors, and cheque protectors. In the case of the first three of these the exports have been more than doubled in the last four years.

The use of new materials in the manufacture of duplicators has considerably enhanced the competitive potentialities of these machines. Great interest was aroused a year or two ago by the production of a duplicator of which the parts to a large extent were made of nylon. The employment of these was preceded by extensive laboratory tests, undertaken at such an early date that they impressed so advanced a country in the manufacture and use of office machinery as the United States.

One of the reasons for the increased popularity of Danish duplicators was the introduction of a new printing technique. By designing a machine which reproduces virtually any textual or pictorial material electronically on a special duplicator stencil, it has been possible to apply the duplicator to a number of purposes previously outside its scope.

Outstanding Designers

The rapidly expanding exports have entailed the erection of a new factory near Copenhagen which is the biggest on the Continent. Here Danish engineers and technicians are engaged on long-term measures to develop and improve the existing models. The industry is also alive to the fact that modern office machinery must be designed so as to fit into its surroundings, and consequently it has sought the advice and guidance of leading Scandinavian designers. Many of the Danish machines now at work in offices all over the world have been designed by such world-famous designers as Sigvard Bernadotte and Acton Bjørn.

What has been said of the construction and design of duplicators applies equally to computors. In spite of exceptionally keen competition in this field, Danish computors have established a fine reputation.

The success of the new Danish computor has been so great that, although the annual output is about 40,000, it has not been possible to introduce it into more than a few markets as yet.

Rivalling the Giants

It is noteworthy that the United States, the home of modern office machinery, has become Denmark's biggest customer for this class of goods. The exports to America testify to the high quality of the machines and to the well-developed and efficient sales organization.

Naturally, a large-scale publicity and sales-promotion campaign has been necessary in order to compete with the giants of the international industry, also because, in addition to ordinary commercial competition, there are import restrictions in many countries.

Altogether, the Danish office-machinery industry has built up a large store of international good will. This is confirmed by the fact that the exports of office machinery have become an important item in Danish export figures.

Four-legged Emigrants

By H. C. Clausen

High milk yield and great adaptability to climate are characteristic of Danish breeding cattle, which are exported to four continents. They are completely free from tuberculosis and foot-and-mouth disease

During the last twenty years Danish farmers have rid their herds of tuberculosis and contagious abortion, and a nation-wide campaign is now under way against infectious mastitis. It follows that the health standards of Danish cattle are very high indeed.

As for milk yield, Denmark has the highest average of any country where records are kept. The average for the financial year from October 1, 1956, to September 30, 1957, of 79,591 herds totalling 868,393 cows, was 4,032 kilograms (8,888½ lb) of milk, 4.34 per cent fat, and 175.2 kilograms (385¾ lb) of butter. This was an increase on the previous year of 223 kilograms (491½ lb) milk, 0.07 per cent fat, and 12 kilograms (26½ lb) butter. Sixty per cent of the Danish cows are recorded.

There has been a big expansion in breeding since the introduction of artificial insemination, which has meant that the best bulls are now more fully utilized than they were. This in turn has caused a reduction in the number of bulls kept and has restricted the domestic market for breeding bulls. As a result, Danish breeders have turned their attention to the export market, where they have achieved a large measure of success.

For UNRRA and the Greek King

In the latter half of the nineteenth century Danish black-and-white cows were exported to the Netherlands, and after the First World War a market was found in the Baltic states and to some extent in Germany. But the exports never reached big figures, principally because they were badly organized. The quality was inferior, the customers were dissatisfied, and the business came to an end. Owing to inadequate quality controls, the international repute of Danish breeding cattle had in fact been spoilt.

The trade did not pick up again until after the Second World War, when UNRRA purchased many Danish cattle with which to renew the destroyed stocks of Poland and Italy. But exports only began in their present form in 1950. This time they were well prepared and organized by the breeding cattle export board of the Danish agricultural organizations.

The first object was to restore the damaged reputation, which was achieved by means of a widespread publicity campaign. The first lot of breeding cattle to be exported in 1950 went to the King of the Hellenes and travelled by air. Seventeen heifers in calf, of the Red Danish Dairy breed, were duly installed on the royal estate at Tatoi. The news of this transaction flew round the world and stimulated other countries to introduce fresh blood into their breeds from Denmark.

Since 1954 there has been a steady flow of exports and some 25,000 of these four-legged emigrants have left their homeland. Confidence in the quality, pedigree, and unfailingly high yield of Danish breeding cattle was restored.

Do Well in Warm Climate

A noteworthy step in proving the ability of Danish cattle to acclimatize themselves in other latitudes was taken in Italy in 1956. The Italian Ministry of Agriculture having refused import licences for Red Danish Dairy cattle on the ground that they might be unsuited to the climate and feeding conditions, the export board initiated large-scale acclimatization tests on the Sutrium estate near Rome. Under the supervision of the animal husbandry research institutions of both the Danish and the Italian Ministry of Agriculture, yield, feeding, and health tests were carried out on 40 Red Danish Dairy and 40 Black-and-White Danish Dairy cows over a period of a year. The cows did well in every test. Their food utilization was higher than the average of recorded cows in Denmark and as high as that of Danish progeny-tested teams of the same yield level.

Already in 1953 Red Danish Dairy cattle had been shown to do well in the

Among the events in the Danish farmer's life are the cattle shows, where selected animals are sent to be judged. The picture is from Bellahøj near Copenhagen

United States, where they had been tested at the large experimental farm belonging to the American Ministry of Agriculture at Beltsville near Washington, D. C. The station is in latitude 39°, the Italian farm being a little further north in latitude 42°. Red Danish Dairy cattle have spread from Beltsville to many states of the union.

Health and Pedigree

The Danish exports comprise Red Danish Dairy, Black-and-White Dairy, and Jersey cows. The first-named breed accounts for about 70 per cent of all Danish herds and is the most characteristic national product. The Black-and-White Dairy, which is a fusion of Jutland Black-and-White Dairy and Dutch dairy cattle, represents 16 per cent. Jersey cattle were introduced about 60 years ago when 5,000 head were imported from the Channel Islands.

Both male and female breeding cattle are exported and they and their progeny are found today in four continents: Europe, Asia, Africa, and South America. The countries which have imported them are Greece, Italy, Yugoslavia, Bulgaria, Roumania, the Soviet Union, East and West Germany, Sweden, Poland, Czechoslovakia, Hungary, France, Spain, Morocco, South Africa, Siam, Indonesia, Brazil, the Azores, and Israel.

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The demand is steadily increasing, and it is expected that this year's exports will break all records. The export board is unremitting in its efforts to ensure the most effective control of health, pedigree, and yield. No exports are permitted without authorized and approved pedigrees and veterinary health certificates, and all animals must have been vaccinated against foot-and-mouth disease by a certain date before export.

Danish agricultural products have a world reputation for quality. The export board knows that if this is to continue to apply to breeding cattle it will not do to ease up on quality restrictions. On the contrary, it is prepared to intensify them in order to preserve the confidence of its customers.

Danish breeding cattle have qualities which make them eminently suitable for export. They can adapt themselves to various climates and conditions. This, together with high milk yield, fixed by many years of selective breeding under the most stringent control, ensures a high-grade product which can transmit its good qualities, thereby laying the foundation of improved quality in the breeds to which it is desired to introduce fresh blood.

Red Danish Dairy cattle, the backbone of Danish livestock farming

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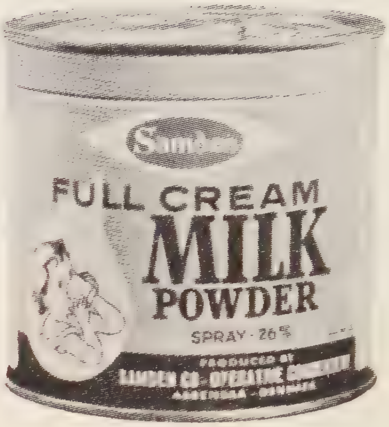
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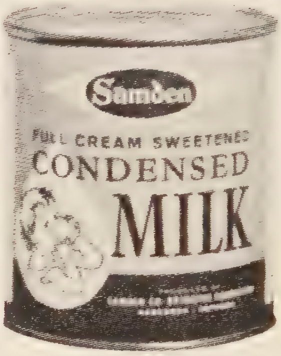
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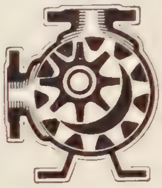

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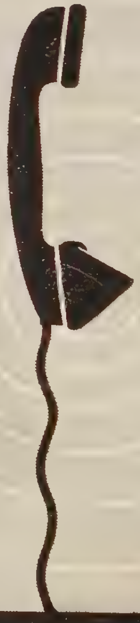

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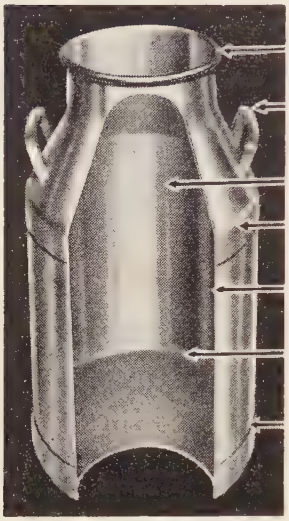

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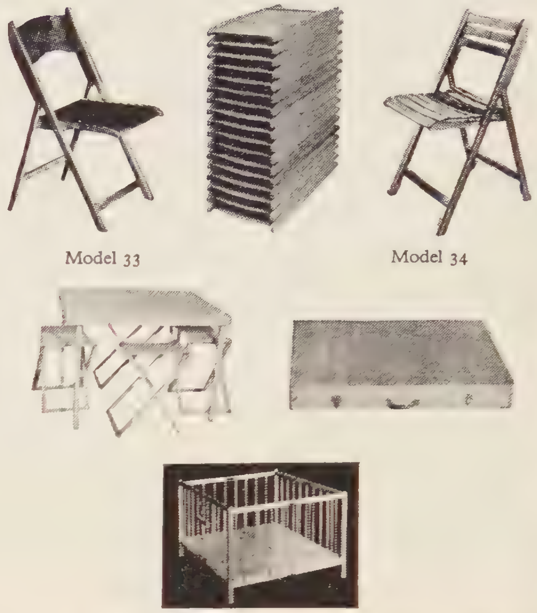

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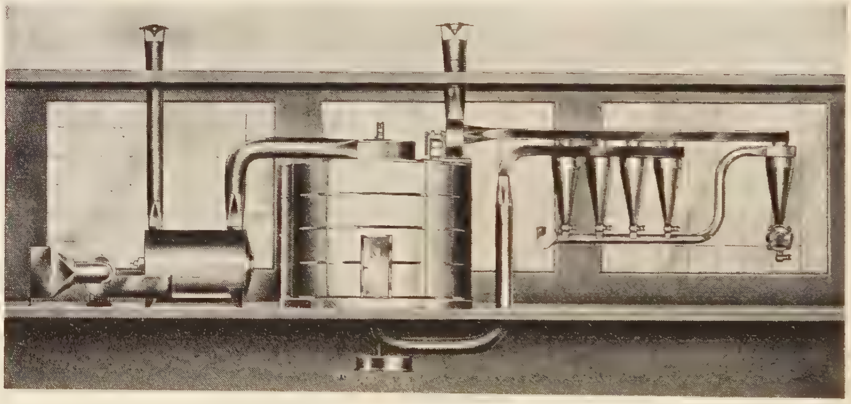

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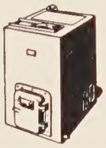

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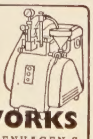

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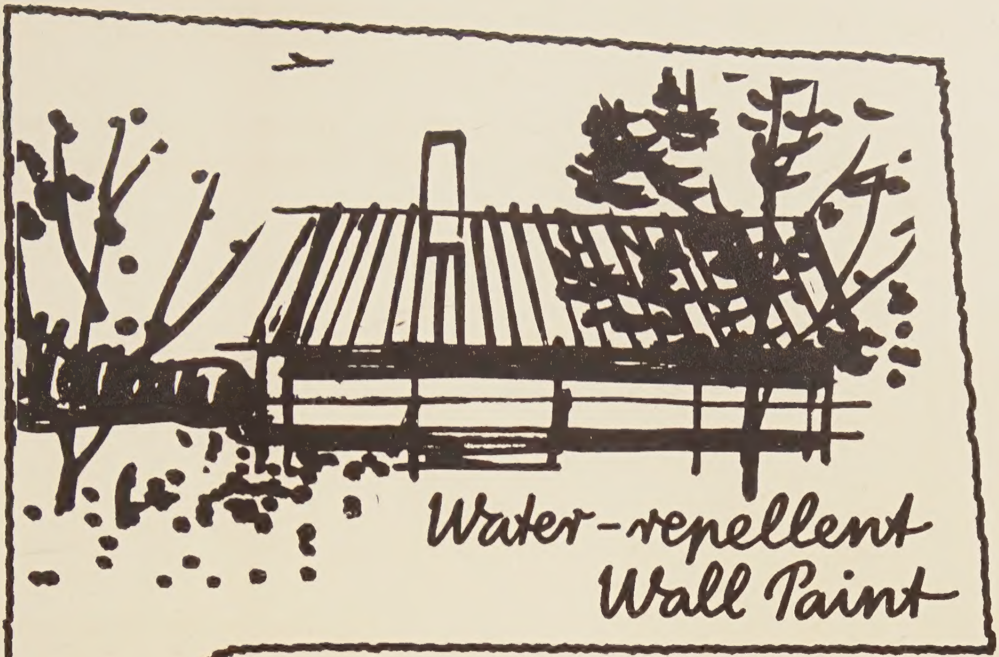

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